NEW PATTERNS OF PRACTICE OF UTAH PHYSICIAN ASSISTANTS

by

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ABSTRACT

Physician assistants (PAs) have become an integral part of the United States (U.S.) health care system since the profession began in the late 1960s. Physician assistants have been suggested as the solution to predicted physician shortages, especially in primary care. Utah has experienced unprecedented growth in the profession over the last 10 years. This study will determine the new patterns of physician assistant practice in the state of Utah.

A cross sectional survey design was utilized. A paper-based survey tool was mailed to 700 physician assistants practicing in Utah. The survey was sent from October 2008 through January 2009. The outcome variables of interest were practice specialty (primary care versus specialty practice) and practice location (urban versus rural). The predictor or independent variables were age, gender, number of years in practice, location of upbringing, and professional school of graduation.

The survey was developed by a group of PA stakeholders based on the literature and relevant clinical and academic experiences. There was a response rate of 67.7%. The Utah Division of Occupational and Professional Licensing (DOPL) provided the list of licensed PAs in the state, while population projections were used from the Utah Governor's Office of Planning and Budget (GOPB).

Projection models for PAs in the state of Utah were developed using methods adapted from the Association of American Medical Colleges (AAMC) Center for Workforce Studies. One model used data on the number of PAs currently in practice, the current utilization of PAs in primary care and specialty care, and future population estimates by age from the GOBP. The second model used data about the number presently in practice and the number that leave the profession through retirement, attrition or death.

Practice patterns are shifting to specialty practice and urban environments in Utah. Physician assistants brought up in a rural area were more likely to practice in rural environments. Female PAs had lower odds of practicing in a rural area. Age and years of practice was not significantly associated with predictors of rural practice. Female PAs had lower odds of practicing in primary care versus their male counterparts. PAs had lower odds of practicing primary care if they reported a rural upbringing. Graduation from the Utah PA Program was more likely to result in primary care practice.

For my father and mother whose support made this possible

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CHAPTER 1

INTRODUCTION

Background

As of 2009, there are 72,433 physician assistants (PAs) clinically practicing in the United States. [1] Sixty-five percent are in specialty or subspecialty practice, and 35% are in primary care. This represents a shift in the last 10 years away from primary care and toward specialty care practice choice for PAs. In the last 10 years there has been rapid expansion of PA programs, applicants and graduates into the workforce. During this time, there have been increasing physician shortages, with fewer medical school graduates choosing primary care specialties.

The number of PAs and nurse practitioners (NPs) in this country now equals the number of family physicians.[2] The number of PAs is growing more rapidly in surgical and specialty care than in primary care. Higher PA salaries tend to trend higher with specialty choice, especially among the higher paid physician specialties.[3] The impact of PAs on primary care may be limited due to numbers of PAs entering specialty practice. Although the absolute number of PAs has increased, it remains to be seen whether the contribution of PAs to primary care will be reduced due to the increased specialization of the nonphysician workforce.

The physician assistant model was first envisioned in the late 1960s. Since then, the educational level of PAs has evolved to primarily a master's degree, with 145 programs currently enrolling students. One-hundred of those programs offer master degrees. [4] Multiple studies have evaluated the role of PAs, including patient satisfaction and productivity. Several studies have compared the outcomes of care between physicians and PAs. Some of the outcomes evaluated in these studies include length of hospital stay, quality of care, patient satisfaction and cost savings. [5] Workforce studies have examined whether PAs are "value added" in a practice, and whether they substitute for physicians. [6]

Despite multiple studies showing acceptable substitution of PAs for physicians, including studies that highlight the cost efficiency of the PA in primary care and specialty care, there are few studies that examine the size and contribution of the U.S. PA workforce. [7] Historically, workforce studies have focused on physician clinicians and have neither gathered data about PAs nor have they considered their potential contribution to health care. [8]

In actuality, the system has come to rely upon the contribution of PAs to the function of health care. The impact of the aging population, the aging of the physician workforce and the propensity to enter specialty care are expected to bring acute shortages in primary care. Physicians are experiencing increasing monetary concerns about medical school debt and the high cost of education. Physician assistants, with their relatively shorter training period and lower cost of education, have been touted as the answer to health care manpower shortages. [9,10]

Physician assistants make up 12% of the workforce in the USA. [11] In Utah, growth of the physician assistant profession has been accelerating. From 2003 to 2009 there has been 116% growth in the number of PAs practicing in the state. The proportion of PAs choosing to practice in nonprimary care specialties continues to increase in Utah as well as in the U.S. [12] However, the absolute number of PAs entering primary care have increased. In 1998 there were 125 PAs practicing in primary care, 57% of the total workforce. By 2008 there were 282 PAs practicing in primary care, a doubling of the number of PAs in this area, yet they made up only 40% of the total workforce. The number of PAs practicing in specialty areas had risen from 93 PAs in 1998, 43% of the total number of practicing PAs, to 418 PAs, or 60% of the workforce in 2008.

Health care workforce analysts and public health officials see this reduction in the percentage of PAs practicing in primary care with concern. Utah has unique demographics, including ranking first in the country for population growth rate. Utah has large numbers of dependent children (greater than 20% of the population) as well as a large numbers of elderly (nearly 10% of the population) including a rather large demographic of those older than 85. [13]

These "oldest old" –– those over 85 years old –– are expected to triple nationally by 2050. [14] Increased utilization of health care services due to this unique demographic profile is a key component in demand projections. It is estimated that 84% of those older than 65 have at least one chronic condition.

The Governor's Office of Planning and Budget (GOPB) projects Utah's overall population to increase from 2.7 million to 3 million by 2012 and another million by

2020. Utah's high fertility rate, larger numbers of elderly and increased utilization of health care services are the three main factors used in demand projections by state workforce analysts. [15]

How will the demand for nonphysician clinicians in primary care change in the future? There are a declining number of medical students, combined with a declining number of medical students entering family practice residencies (10% of the 2009 University of Utah School of Medicine entered a family practice residency). One might predict that due to this declining number of medical students and residents entering primary care, the market will most likely turn to nonphysician clinicians to fill the provider gap. For rural Utah, where primary care providers are the preferred providers, this shortage could be more acute.

The 10 Essential Services of Public Health published on the CDC website [16] discusses the need to assure access to health care services and health care personnel when otherwise unavailable. One of the 10 essential services is to assure a competent health care workforce and to provide services to those who are in need. PAs have been shown to increase access to the underserved [17] and may increase access should physician shortages become acute. [18]

Conclusion

The increasing choice of subspecialty practice among nonphysician providers could be a major factor in projected provider shortages in primary care. But with increasing specialization of PAs, there may be increasing primary care shortages at a time when age polarization, increased demand for services, and a decline in primary

care choice for physicians is making PAs more needed than ever before. This research seeks to answer some of these questions about the impact PAs are making or could possibly make in the future if current trends continue.

Primary care workforce issues and the needs of the state of Utah for providers in rural and underserved areas are of paramount importance to this research. Questions about the role physician assistants and their potential to offset physician shortages remain. What are the predictors of primary care practice among physician assistants in Utah? Are physician assistants willing or able to provide care in rural areas, where physicians have traditionally been scant? Does the addition of more PAs in unprecedented numbers benefit both primary care and specialty care? What can be predicted about the supply of PAs into the future?

Although Advance Practice Registered Nurses (APRNs) also contribute to the health care workforce in the state of Utah, difficulty assessing data on the APRN workforce precluded their analysis in this study.

- This project will examine the Utah Medical Education Council (UMEC) 2008-2009 survey of physician assistants. UMEC data will be used to predict patterns of practice and look for predictors of practice patterns in PAs with regard to primary care versus specialty care practice and rural versus urban practice.
- The first part will be accomplished by a thorough review of the literature for research that can inform and guide further research into the workforce needs of the state. The goal will be to understand previous research on

physician and physician assistant workforce studies and literature on predicted primary care shortages.

- The second part will examine the predictors of rural versus urban and primary care versus specialty care patterns of PAs in Utah.
- The third part will examine the workforce projections of PAs in Utah using the UMEC 2008-2009 survey of physician assistants. The predicted supply of PAs is based on two projected models for the next 15 years.

References

1. American Academy of Physician Assistants (AAPA). *American Academy of Physician Assistants AAPA Data and Statistics* 2009.

2. Green LA, Dodoo MS, Ruddy G, et al. Family physicians and the primary care physicians workforce in 2004. *Am Fam Physician.* Jun 15 2005;71(12):2260.

3. Morgan PA, Hooker RS. Choice of specialties among physician assistants in the United States. *Health Aff (Millwood).* May 2010;29(5):887-892.

4. Physician Assistant Education Association (PAEA). *25th Annual Physician Assistant Education Report* 2009.

5. Hooker RS. Do physician assistants provide a "social good" for America? *JAAPA.* Sep 2009;22(9):12.

6. Morgan PA, Shah ND, Kaufman JS, Albanese MA. Impact of physician assistant care on office visit resource use in the United States. *Health Serv Res.* Oct 2008;43(5 Pt 2):1906-1922.

7. Hooker RS, Berlin LE. Trends in the supply of physician assistants and nurse practitioners in the United States. *Health Aff (Millwood).* Sep-Oct 2002;21(5):174-181.

8. Morgan PA, Strand J, Ostbye T, Albanese MA. Missing in action: care by physician assistants and nurse practitioners in national health surveys. *Health Serv Res.* Oct 2007;42(5):2022-2037.

9. Cawley JF. Physician assistants and Title VII support. *Acad Med.* Nov 2008;83(11):1049-1056.

10. Mullan F. Still closing the gap. *Health Aff (Millwood).* Jul-Aug 2009;28(4):1183-1188.

11. Jones PE. Physician assistant education in the United States. *Acad Med.* Sep 2007;82(9):882-887.

12. Utah Medical Education Council (UMEC). *Utah's Physician Assistant Workforce* 2010.

13. Utah Department of Health. Utah Office of Primary Care and Rural Health. Salt Lake City, UT: Utah Department of Health; 2004: http://www.health.state.ut.us/primary_care/.

14. Zhang X, Phillips RL, Jr., Bazemore AW, et al. Physician distribution and access: workforce priorities. *Am Fam Physician.* May 15 2008;77(10):1378.

15. Governor's Office of Planning and Budget (GOPB). Population Estimates State of Utah and Counties 1940-2009: Utah Governor's Office of Planning and Budget, 18 Mar 2010.; 2010.

16. 10 Essential Public Health Services. *National Public Health Performance Standards Program (NPHPSP)* http://www.cdc.gov/od/ocphp/nphpsp/EssentialPHServices.htm.

17. Staton FS, Bhosle MJ, Camacho FT, Feldman SR, Balkrishnan R. How PAs improve access to care for the underserved. *JAAPA.* Jun 2007;20(6):32, 34, 36.

18. Cooper RA. New directions for nurse practitioners and physician assistants in the era of physician shortages. *Acad Med.* Sep 2007;82(9):827-828.

19. Hooker RS, Cawley JF, Asprey DP. *Physician assistants : policy and practice*. 3rd ed. Philadelphia: F. A. Davis Co.

CHAPTER 2

THE PHYSICIAN ASSISTANT WORKFORCE: NEW TRENDS FROM THE LITERATURE

Abstract

The purpose of this study is to review the salient literature on workforce as it relates to physician assistants and primary care shortages. Core areas of interest include national and state-specific physician assistant research and national physician and family physician workforce research and modeling. Large national databases and state specific studies have begun to include physician assistants, although limitations exist. Although physician workforce experts do not agree, national physician workforce modeling does suggest primary care shortages are on the horizon. PAs have been included in workforce modeling, although a variety of conclusions exist about how much they will be able to contribute to the reduction of these possible shortages.

Introduction

There is a worsening shortage of physicians, especially in primary care. [1, 2] Physician assistants (PAs) have been looked at to offset the increasing shortages predicted in primary care. The number of PAs and NPs combined now equals the

number of family practice physicians in this country [3]. Multiple workforce studies have sought to answer some of the questions about the future supply of health care providers.

In response to growing fears of physician shortages in primary care and the aging of the population, it has been proposed that PAs could provide the majority of the frontline primary care services. [4, 5] However, there are concerns about increasing specialization of the PA workforce, as well as concerns over the total growth needed in the profession to handle this undersupply of physicians. [6]

The aim of this paper is to review the physician and physician assistant workforce literature for previous methods used in workforce projections with a special emphasis on primary care needs. The first part will be accomplished by a thorough review of the literature for research that can inform and guide the workforce needs of the PA profession.

Health care workforce researchers do not agree on the best methods to analyze trends in the supply of physician or PAs. There is no federal management or control over the supply of health care workers. Multiple physician groups, including the Council on Graduate Medical Education (COGME), the American Medical Association (AMA), and the American Academy of Family Physicians (AAFP) have published papers on the workforce supply of physicians. None have utilized similar methods or come to similar conclusions. The physician assistant profession is very interested in the primary care workforce supply debate, with the inclusion of a PA perspective in research and data collection. [7]

This literature review will highlight insights from the physician and physician assistant workforce literature.

Methods

The literature was searched and catalogued looking at the last 10 years of research on primary care workforce studies and reports. The literature search accessed and selected published articles, reports and research studies through the University of Utah Eccles Health Sciences Library.

Core areas of interest related to physician, PA primary care and workforce studies were selected for study and categorization after a preliminary review of the selected articles and research studies. These core areas were: (1) national physician assistant research, (2) state-specific physician assistant research, (3) national physician research, (4) national family medicine physician research, and (5) Utah physician workforce research.

Articles, research studies and reports were included in the research summary if they were published in the last 10 years and addressed the United States health delivery system. Although Canadian, Australian and United Kingdom studies were plentiful, they were not included in the research summary. The centralized system of Canada and UK make any comparisons to the U.S. too difficult and therefore not relevant. The Australian system is a hybrid of public and private insurance and the physician assistant profession has only begun to train practitioners.

The criteria for considering studies in this paper were workforce research, survey research, and studies generated by the Federal or State government (i.e. U.S. Department of Health and Human Services), or professional organizations (i.e., American Academy of Family Physicians). The focus of included papers was on primary care including general practitioners, family physicians, general pediatricians, general internal medicine, obstetrics, gynecology, geriatrics, and physician assistants (PAs).

The following MeSH terms were used to search Pub Med

MeSH Terms:

Primary health care/manpower

Physician assistants/supply & distribution

Physician assistants/trends

United States

Pub Med was also searched using the terms:

Primary Care

Workforce

In addition, the Library of Congress, LISTA (EBSCO), National Library of Medicine (NLM), CINAHL (OvidSP) and the Web of Science (WS), ERIC (OvidSP) and The Cochrane Collaboration were searched using the MeSH search terms above. Individual states' websites were searched using Google using the search terms "health care" and "workforce." Google Scholar was used to also look for workforce studies published on the Web. Finally, Academy Health (AH), Association of

American Medical Colleges (AAMC) and American Academy of Physician Assistants (AAPA) websites were searched individually.

The initial searches identified over 505 potentially relevant articles without limits to year or country. One hundred forty-one references were identified as U.S.-based investigations of relevant workforce issues. Sixty-five of these studies were identified as reaching the relevant criteria of primary care, U.S., workforce projections, methodology discussions, or policy discussions with data or analysis, and within the last 10 years. The articles were then organized into categories involving either national or state-specific physician assistant, physician and/or family physician workforce research.

Results

National Physician Assistant Research

The use of PAs in the U.S. health care workforce has risen rapidly in the last decade. From 1990 to 2010, the number of PA educational programs has risen from 54 programs to 148 programs; a 174% increase. [8] In 2009, there were 97,721 PAs employed in the US, according to the Integrated Public Use Microdata Sample-USA (IPUMS-USA) data. [9] Health care researchers are increasingly utilizing national databases to quantify this growth of PAs in the workforce of the U.S. health care system.

Three recent studies have looked at large national databases that specified PAs as providers in the collection of the survey. In 2001, Hooker and McCraig used NAMCS to describe primary care physician assistants from 1995-1999 encounter

data. The National Ambulatory Medical Care Surveys (NAMCS) database is collected by the Center for Disease Control and Prevention (CDC) as part of the U.S. Department of Health and Human Services, National Center for Health Statistics. This database is a survey of sample physician offices. [10]

According to the analysis by Hooker and McCraig, about one-quarter of primary care offices used PAs and/or NPs. Among this group of primary care physicians, about 82% of them used PAs or NPs for fewer than 20% of visits. The practice characteristics for the physician offices that used midlevel practitioners were the same as those that did not. However, the authors felt the database and subsequent analysis underestimated the percentage of primary care being provided by NPs and PAs in this country. NAMCS data did not sample federally employed physician offices (the largest employer of PAs), nor did it sample the military or state governments. [11] NAMCS sample is drawn from physician lists and likely is inconsistent in revealing PA or NP care. [7, 12]

Further, the 2006 National Ambulatory Medical Care Surveys (NAMCS), Hing and Burt used new information on availability of midlevel providers, in this case, physician assistants, nurse practitioners, and certified nurse midwives. In 2006, 11.5 percent of medical practices employed at least one midlevel provider. Availability of midlevel providers was greater among multispecialty groups than among solo practitioners or single-specialty groups and increased with size of practice; practices of 3-5 physicians utilized the most NPs/PAs. [13]

Recently several specialty practice PA groups have utilized the National Hospital Ambulatory Medical Care Survey (NHAMCS) to discuss the growing use of

PAs in emergency departments [14], and surgical settings. [15] Nyberg et al. used a survey mailed to 464 directors of major trauma centers in the United States. The survey was designed to evaluate trauma centers' utilization of PAs/NPs. The results showed American College of Surgeons (ACS)-verified trauma centers reported more utilization of PAs/ NPs than non-ACS verified trauma centers. This may indicate a trend to fill resident physician work hour shortages with PAs and NPs due to the implementation of Accreditation Council for Graduate Medical Education (ACGME) resident work hour limitations (no more than 80 hours a week). These recent studies show an interest in the study of the effectiveness of this strategy for replacing house officers.

The PA profession in the U.S. began in the late 1960s and has increased to nearly 100,000 PAs licensed to practice medicine with a supervising physician. PAs are now practicing in a wide range of specialty areas. PAs and NPs may be undercounted or inadequately accounted for by national databases used to assess hospital and office-based practice patterns in the U.S. They may also be filling shortages in specialty care, in contrast to the original intention to augment shortages in primary care and underserved settings.

State-Specific Physician Assistant Research

State-specific studies of workforce issues with NP and PAs are increasingly important. The AAPA keeps a very accurate master file for PAs on a national level. This can also be stratified by state. Although this database exists, state workforce organizations and departments continue to focus on their state-specific data and

may under-utilize national data as they draw workforce conclusions and make recommendations. Local workforce adjustments and incentives can be effective in addressing unique health care needs of individual states. State data are sometimes one of the most accurate sources of data because they often come from licensure files and therefore can be very complete. Additional questions about productivity, PA-physician interaction and supervision based on specific state licensure requirements and reasons for practicing in a state can be explored more fully at the state level.

Several states and regional health workforce centers collect data about the trends in the supply of PAs. The North Carolina Health Professionals Data System (http://www.shepscenter.unc.edu/hp/) publishes downloadable tables in Excel and PDFs by state and county totals, comparing all health professionals per 10,000 population ratios including maps of physicians, primary care physicians, and physician assistants among other professionals.

The state of Colorado uses the Colorado Health Institute to fund projects on workforce issues including a central repository for data on physician assistants collected in the state. They are involved in an Interdisciplinary Model of Care study funded by the Colorado Trust that will look exclusively at primary care (http://www.coloradohealthinstitute.org/). This study will look at the use of nonphysician primary care providers (including PAs) exclusively or as part of an interdisciplinary team model of care.

Three notable studies analyzing primary care clinicians inclusive of physicians, PAs and NPs are: (1) Grumbach et al. in an article entitled, “Who is

Caring for the Underserved? A Comparison of Primary Care Physicians and Nonphysician Clinicians in California and Washington," (2) Pedersen et al. in the article, "The Productivity of PAs, APRNs and Physicians in Utah," and (3) Larsen et al. in "The Contribution of Nurse Practitioners and Physician Assistants to Generalist Care in Washington State." [16, 17, 18]

In the Grumbach study, PAs and NPs ranked ahead of primary care physicians in likelihood of serving rural locations. [16] The article by Grumbach et al. was published with support from the WWAMI Center for Health Workforce Studies. They utilized an analysis method that computed the percentage of clinicians in each discipline (e.g., family physician, NPs, PAs) that practiced at locations considered underserved, either primary care health professional shortage areas (HPSA) or medical service study areas (MSSAs) or rural health shortage areas (HSAs).

One of the complications of this type of research is that each state uses different classifications (and abbreviations) with different definitions. For example, in California, rural MSSAs are defined as areas with a population of less than 250 residents per square mile and containing no city of 50,000 or more residents. In Washington, the rural HSA is defined as (1) not being in a metropolitan statistical area (MSA) or (2) being within a MSA but more than 30 minutes average travel time from a population base of 10,000 or more.

Regardless of the difficulties in using state specific definitions of "underserved," the researchers were able to compute the percentages of clinicians in each discipline who practiced in an "underserved location." Then the percentages were analyzed for statistically significant differences using chi square tests. Logistic

regression models were computed separately for each state to analyze the independent effect of each discipline on the odds of practicing in an underserved community.

The results showed family physicians were more likely than other primary care physicians to practice in rural and underserved areas ($p<.001$). PAs had the largest proportion of their members practicing in rural and underserved areas ($p<.001$). Therefore, the contribution of PAs and family practice physicians are of great importance to states with large rural and vulnerable populations. [16]

Larson et al. employed another method to compare NPs and PAs in Washington. Although the study did not mention in its title the inclusion of primary care physicians, the method did include a study population consisting of physicians, NPs, and PAs who renewed their professional licenses between April of 1998 and May of 1999. [18] These researchers employed a cross-sectional designed research method. The analysis utilized a method in which the numbers of outpatient visits per week were converted into full-time equivalents (FTE), so the contribution of each type of provider could be compared across the professions.

The principal findings showed NPs and PAs provided approximately 20% of the entire primary care outpatient visits in the state of Washington. After converting the data from head counts to FTE, the contributions of NPs and PAs were quite large, and higher than physicians, most notably in rural and HPSA designated areas.

The same methodology was used by Pedersen et al. to calculate, using self-reported productivity data collected in Utah, the contribution of each type of

provider to primary care. As well, the data can be looked at for the total percent FTE for each type of provider as well as the location (rural or urban) and the specialty (primary care or specialty care). [17] In this study a comparison between primary care and nonprimary care clinicians was made, as well as a comparison between rural clinician FTE and urban clinician FTE in Utah.

In conclusion, the utilization of PAs and NPs in the U.S. health care workforce is not well studied on a national or state level. Questions persist as to how the PA profession impacts the delivery of care, let alone the geographic distribution, primary care focus, productivity and quantity of providers. As PAs provide a growing share of medical care in the United States, some policy planners and workforce analysts suggest PAs and NPs could provide the bulk of primary care, as physicians seek specialty residencies. [5] Lack of data and lack of inclusion of PAs in workforce studies make this type of policy planning difficult. Individual states, often in conjunction with academic partners, have also recently undertaken workforce activities on physician assistants. These data can help identify state specific trends and needs in the physician assistant workforce, and can be used by state policy makers to make decisions to allocate resources based on identified workforce deficits and needs. Some states, such as Texas, Iowa, Colorado, Utah, and North Carolina, provide legislative funding to look at state health care concerns, including PAs and NPs in their formulas. [19]

National Physician Research

There is very little agreement on the "best" methods to employ to look at primary care workforce issues. The Physician Aggregate Requirements Model (PARM) is a model used by the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA) to model physician workforce needs. This model uses a combination of U.S. population, age, race, and different types of insurance systems. The model used 22 health professional categories, and was not designed specifically with NP or PA research questions as their primary purpose. [20]

The data sources used were the U.S. Census Bureau demographic predictions of fertility rates, mortality rates and migration. The workload measures were national databases of physician encounters in a variety of settings (doctors' offices, nursing homes, hospital inpatient and outpatient practices). The national databases used were primarily the National Ambulatory Medical Care Survey (NAMCS). The conclusions were that the aging of the population was a major factor in the demand for future health care workers. Also, the changing ethnic composition of the population will be a factor. They predicted that, although most of the US population will live in urban areas, rural areas would continue to need health care workers.

In the COGME physician workforce study from HRSA, using the baseline year of 2000, the status quo scenario showed a need to increase by 28% the number of primary care physicians by 2020.[20]

The 2005 COGME report concluded that there will be increased demand for physicians, a supply of physicians that will not meet the demand, and a need for

services based on universal insurance. As well, they noted shortages might develop in specialty or nongeneralist specialties. The strength of their model is that it takes into account new physicians including international medical graduates (IMGs), retirement calculations, gender distributions, and nonpatient care activities. It mentions and calculates PAs/NPs into the model. It also models scenarios that take into account lifestyle changes among physicians and productivity increases. [20]

Cooper et al. used an economic model that argues economic expansion, or GDP per capita, is correlated with the supply of physicians. [21] The assumption is that the GDP will increase between 2000 and 2020. However, after Cooper published his report in 2002, the GDP has not risen so steadily. The GDP in 2009 was -2.2%. [22] It may be difficult to tie physician supply, with its traditionally long training period, to the ups and downs of the recent economic cycles.

The other limits of the Cooper model are age and demographic related. One assumption used is that the characteristics of the population remain static. Further, a system that only counts physician heads versus population does not take into account the aging baby boomer cohort. There are a high number of potential variables impacted by the aging of the population in terms of healthcare service utilization. This is where physicians alone may not be in demand, but other types of services as well, including long-term care providers, certified nursing assistants, nutritionists, and pharmaceutical manufacturers and providers.

It is important to remember that results from a workforce formula do not necessarily determine the healthiest solution for the population. In an article called "The Physician Workforce Crisis: Where is the Evidence?" by Goodman and an

article, "More Physicians Are Not the Answer" by Greenberg and Greenberg, authors suggest that there is little evidence to support an increasing supply of physicians to treat the growing aging population and patients with chronic illnesses. [23, 24] Work from the Dartmouth Institute suggests the number of physicians is not correlated with health outcomes; at least partly because of subspecialty predominance in areas with high numbers of physicians. [5] However, most research supports the notion that more primary care clinicians are correlated with better health of the population. [25]

In fact, Cooper wrote in Academic Medicine in 2007 "New Directions for Nurse Practitioners and Physician Assistants in the Era of Physician Shortages" about shifting needs in primary care, physician shortages and the opportunities for NPs and PAs. [4] There may be increasing numbers of physicians entering specialty care and NPs and PAs to fill the gap in primary care.

National Family Medicine Physician Research

Differing conclusions exist within the workforce literature. A family medicine perspective entitled “The Physician Workforce of the United States: A Family Medicine Perspective” came from the Graham Center Policy Studies in Family Medicine and Primary Care. [26] This report reviewed prior physician workforce studies and addressed the supply and demand for family physicians in the next 5 to 15 years. The projected numbers of family physicians needed in this study varied widely depending on the assumptions and methods used. The article recognized this and presented some of the different models, including a need model

and a demand/supply model. The demand/supply model was developed as part of the study and resulted in the highest projected need for family physicians by 2020.

According to Green et al., in 2004, there were 31.2 active family physicians per 100,000 people. In absolute numbers, there were 91,600 family physicians, and 222,000 primary care physicians actively caring for patients, one for every 1,321 persons. Green et al. concluded there were sufficient numbers of family medicine physicians combined with other primary care type physicians such as general pediatricians, general internal medicine, nurse practitioners, physician assistants, international medical graduates. Their conclusion was that the debate should be moved to the distribution of family physicians rather than the total number. [26]

Family Physician Workforce reform as approved by the 2006 Congress of Delegates Recommendations of the American Academy of Family Physician came to the opposite conclusion. This was the first workforce policy update in nearly 10 years by that organization. [27] The assumptions were that primary care does impact the health of the nation, the U.S. population is aging, different populations may have differing health care utilization needs, the number of internal medicine physicians providing primary care is decreasing, and the number of NPs and PAs entering primary care is limited due to increasing specialization of their workforce. Finally, they predicted that family physicians would adopt a new model of family practice, the personal medical home, which will allow them to take care of more patients per family physician.

The study limitations included assumptions that national trends in the U.S. economy would not change (the report was published in 2006) and that medical

technology advances would continue to increase (basically predicting a steady linear increase) into the future.

The data sources used included the National Ambulatory Medical Care Survey (NAMCS), the National Hospital Ambulatory Medical Care Survey (NHAMCS), the Medical Group Management Association (MGMA), the Physician Compensation and Production Survey, and the Area Resource File (ARF) from the Department of Health and Human Resources. The National Center for Health Statistics (NCHS) was used for mortality data, and the U.S. Census was used for population changes by age and gender up through 2020.

The conclusions were, using 2020 as a target, a rather large cohort of family physicians would be needed, an increase of almost 40,000 physicians. This could be achieved by increasing allopathic family medicine residency programs and medical school class size. The report supported a move to Patient-Centered Medical Homes (PCMH), increase National Health Service Corps (NHSC) funding and strengthen the Community Health Centers (CHCs).

Utah Physician Workforce Research

The Utah Physician Workforce study published in 2006 found there were 4,484 physicians working in Utah, which equated to 165 physicians per 100,000 in population. In 2003, 29% of Utah physicians were in generalist fields, and rural areas might have shortages. This study estimates Utah will need to recruit up to 270 physicians per year due to population growth, age demographics, loss of FTE, and

physician retirement. Mostly out-of-state-trained physicians will be needed because Utah medical schools will only meet 19%-22% of the projected annual demand. [28]

The methodology the Utah Medical Education Council (UMEC) used for their physician study was first to estimate the projected demand for physicians. The population of Utah is growing, and Utah has a high birth rate and a high age cohort over 65. The average age of Utah physicians is reaching retirement and the estimation is that increasing numbers of physicians will be retiring over the next 5-10 years. The projected supply is based on the fact that Utah has one medical school that graduates 80 students a year and 52 residency programs that graduate 175 to 200 physicians a year. Only 52 to 60 of these residents graduate and remain in Utah. [28]

There is mention of midlevel providers in this article. The authors note the scope and practice of midlevel providers has expanded. This article uses the same methods employed by WWAMI Center for Health Workforce Studies and Pedersen et al., using a primary care physician FTE of 105 outpatients visits per week, and then calculating a physician equivalent. Data from the American Medical Association indicated that an average family physician provides 105 ambulatory patient visits each week. [29] The article determined that the clinical equivalent of midlevel providers in Utah equates to 43 physicians or 16% of the required physician workforce. No attempt to account for case-mix was included in the analysis. The numbers used were based on current usage that may not be optimal. When providers are compared across the professions, especially from physician to

PA or NP, the lack of analysis of case-mix is an overall weakness in many of these studies. [28]

Workforce Planning

The use of nonphysician clinicians including PAs has been promoted as having tremendous potential impact on primary care physician shortages. However, limited published literature exists that could inform health care workforce policy makers on numbers needed to fill these primary care shortages. Increasing numbers of studies are being done on national databases, but primarily to show increasing utilization in specialty care such as trauma centers, surgery and emergency departments. More studies will need to be performed to assess both local and national health workforce needs from the perspective of primary care.

In a report called, *Out of Order, Out of Time: The State of the Nation's Health Workforce*, the Association of Academic Health Centers (AAHC) stated the need to "focus attention on the critical need for a new, collaborative, coordinated, national health workforce planning initiative." The AAHC's report noted the nation's workforce planning efforts were uncoordinated and lacked vision. Without any clear vision from the federal government, individual states have been left to plan for workforce needs on their own. To compound the problem, the AAHC report also emphasized the states themselves have lacked resources and coordination of research and methods.

Health care workforce needs are locally dependent on variables such as rural and urban populations, population age, demographics, and the health of the

members of each community. Therefore, state-level research and workforce planning could be tailored to the needs of unique populations (states with large rural and urban growth areas such as Utah). There is, however, no coordination between states on health workforce planning or even research design or methodology. According to the AAHC,

> Leaving each state to address health workforce matters is problematic in many ways. While state officials consistently report that success of workforce initiatives depends upon direct support from the governor's office, activity and involvement by governors in health workforce issues vary greatly. [30]

Several researchers have expressed concern over the lack of national databases collecting PA workforce data. Morgan and Strand found several of the national surveys inadequately account for the contributions of PAs and NPs, may not take into account the team utilization of PAs and NPs, and may create an inaccurate picture of the contribution and synergy of the midlevel provider. [7]

For example, three of the surveys Morgan et al. discuss belong to the National Center for Health Statistics National Health Care Surveys (National Center for Health Statistics) and the other two are from the Agency for Healthcare Research and Quality. Although these surveys are similar, they employ very different methods and have limitations in their coverage of PAs and NPs.

In several of these national surveys, PAs and NPs may be under sampled. In the National Ambulatory Medical Care Survey, the methodology employs a sample of physician's practices, and obtains data from patient encounters sampled from a physician's schedule during an assigned week. PAs and NPs who work closely with an individual physician sampled might be represented, but not PAs and NPs who

have their own individual daily roster of patients. Other national surveys also may underestimate the contribution of NPs and PAs. [7]

Recently the Patient Protection and Affordable Care Act (PPACA) was signed into law on March 30, 2010. This legislation recognized the need for better data and workforce research to aid health care professions to assure an adequate workforce. The National Health Workforce Commission and the Health Resources Services Administration (HRSA) Advisory Committee on Primary Care Training were created to guide these activities. Health Professions Programs under Title VII that include physician assistant programs were strengthened.

Conclusion

A review of the literature on workforce research shows almost no coordination of research methods nationally or between states. There are often multiple sources of information, with very little central data collection. There is a lack of uniform agreement on the methodological approach to workforce research, as well as a common unifying approach to modeling future health care supply needs.

Unfortunately highly different methods produce widely differing numbers of providers. The difficultly in predicting the future, and the lack of uniformity of data collection compounds the problem. Local workforce studies, especially at the state level, will continue to be important. With increasingly scarce state resources it will be important to collect the data in an efficient manner. This will allow policy decisions at the state and national level to be implemented more quickly. Workforce data and assumptions, such as what health care system will be in place and what

technology advancements will be made, are critical to examine. The analysis is constantly shifting, and therefore the studies need to be repeated frequently, and with similar data collection methods and methods of analysis so that adjustments can be incorporated. With expected increases in the numbers of people seeking care due to healthcare reform, more dynamic analysis will be needed quickly.

Primary care is of critical importance to the health of this country and the vitality of health care. Physician assistants have been a critical part of this since their inception in the late 1960s and early 1970s. During the past 40 years of this relatively new profession, the role of the PA has evolved to include a great deal of health care responsibility and filling the gaps in shortages of physicians in both specialty and primary care.

If the health of the country is founded on the fundamental principles of access to primary care, with predicted shortages of primary care physicians and more health care utilization due to an aging population of baby boomers, the lack of workforce data will soon become critically evident. If health reform is to be successful, opportunities to increase access to health care services reside with PAs. Despite the critical role of PAs in access to health care, much health care workforce research does not include PAs in an integrative way in health care workforce planning and research.

References

1. Brotherton SE, Rockey PH, Etzel SI. US graduate medical education, 2004-2005: trends in primary care specialties. *JAMA.* Sep 7 2005;294(9):1075-1082.

2. Kane GC, Grever MR, Kennedy JI, et al. The anticipated physician shortage: meeting the nation's need for physician services. *Am J Med.* Dec 2009;122(12):1156-1162.

3. Green LA, Phillips RL, Jr. The family physician workforce: quality, not quantity. *Am Fam Physician.* Jun 15 2005;71(12):2248, 2253.

4. Cooper RA. New directions for nurse practitioners and physician assistants in the era of physician shortages. *Acad Med.* Sep 2007;82(9):827-828.

5. Goodman DC, Grumbach K. Does having more physicians lead to better health system performance? *JAMA.* Jan 23 2008;299(3):335-337.

6. Hooker RS, Cawley JF, Leinweber W. Career flexibility of physician assistants and the potential for more primary care. *Health Aff (Millwood).* May 2010;29(5):880-886.

7. Morgan PA, Strand J, Ostbye T, Albanese MA. Missing in action: care by physician assistants and nurse practitioners in national health surveys. *Health Serv Res.* Oct 2007;42(5):2022-2037.

8. Physician Assistant Education Association PAEA. *25th Annual Physician Assistant Education Report* 2009.

9. He X, Cyran E, Salling M. National trends in the United States of America physician assistant workforce from 1980 to 2007. *Human Resources for Health.* 2009;7(86).

10. Hooker RS, McCaig LF. Use of physician assistants and nurse practitioners in primary care, 1995-1999. *Hosp Q.* Fall 2001;5(1):32-36.

11. Cawley JF, Jones PE. Nonphysician clinicians in the health care workforce. *JAMA.* Feb 10 1999;281(6):509-510; author reply 511.

12. Williams SJ, Elder JP, Seidman RL, Mayer JA. Preventive services in a Medicare managed care environment. *J Community Health.* Dec 1997;22(6):417-434.

13. Hing E, Burt CW. Characteristics of office-based physicians and their medical practices: United States, 2005-2006. *Vital Health Stat 13.* Apr 2008(166):1-34.

14. Menchine MD, Wiechmann W, Rudkin S. Trends in midlevel provider utilization in emergency departments from 1997 to 2006. *Acad Emerg Med.* Oct 2009;16(10):963-969.

15. Jones PE, Cawley JF. Workweek restrictions and specialty-trained physician assistants: potential opportunities. *J Surg Educ.* May-Jun 2009;66(3):152-157.

16. Grumbach K, Hart LG, Mertz E, Coffman J, Palazzo L. Who is caring for the underserved? A comparison of primary care physicians and nonphysician clinicians in California and Washington. *Ann Fam Med.* Jul-Aug 2003;1(2):97-104.

17. Pedersen DM, Chappell B, Elison G, Bunnell R. The productivity of PAs, APRNs, and physicians in Utah. *JAAPA.* Jan 2008;21(1):42-44, 47.

18. Larson EH, Palazzo L, Berkowitz B, Pirani MJ, Hart LG. The contribution of nurse practitioners and physician assistants to generalist care in Washington State. *Health Serv Res.* Aug 2003;38(4):1033-1050.

19. HWIC. *Health Workforce Information Center* 2010; http://www.hwic.org/states/. Accessed August 2010.

20. Council on Graduate Medical Education COGME. Physician Workforce Policy Guidelines for the United States, 2000-2020. 2005.

21. Cooper RA, Getzen TE. Health care spending in one chart. *Health Aff (Millwood).* May-Jun 2002;21(3):279.

22. Bureau of Economic Analysis US Department of Commerce. 2009; http://www.bea.gov/national/index.htm#gdp.

23. Greenberg JO, Greenberg H. More physicians are not the answer. *American Journal of Cardiology.* MAY 15 2007;99(10):1476-1478.

24. Goodman DC. The physician workforce crisis: where is the evidence? *Health Aff (Millwood).* Jan-Jun 2005;Suppl Web Exclusives:W5-108-W105-110.

25. Becker KL, Carleton S, Lin GI. The state of primary care. *N Engl J Med.* Dec 14 2006;355(24):2596-2597; author reply 2598.

26. Green LA, Dodoo MS, Ruddy G, et al. Family physicians and the primary care physicians workforce in 2004. *Am Fam Physician.* Jun 15 2005;71(12):2260.

27. AAFP. Family Physician Workforce Reform: Recommendations of the American Academy of Family Physicians. October 2008; http://www.aafp.org/online/en/home/policy/policies/w/workforce.html.

28. Ha J, Utah Medical Education Council. *Utah's physician workforce : a study on the supply and distribution of physicians in Utah.* Salt Lake City, Utah: Utah Medical Education Council;2006.

29. Randolph L, Seidman B, Pasko T, American Medical Association S, Data R. *Physician characteristics and distribution in the U.S*. Chicago, IL: Dept. of Physician Data Services, Division of Survey and Planning, American Medical Association; 1996.

30. *Out of order, out of time: the state of the nation's health workforce.* Washington, DC: Association of Academic Health Centers, 2008.

CHAPTER 3

FACTORS ASSOCIATED WITH PHYSICIAN ASSISTANT PRACTICE IN RURAL AND PRIMARY CARE IN UTAH

Abstract

Physician Assistants (PAs) have become an integral part of the United States (U.S.) health care system since the profession began in the late 1960s. PAs have been suggested as solutions to predicted physician shortages especially in primary care. The state of Utah has experienced unprecedented growth in the profession over the last 5 years. This study examined the predictors of primary care and rural practice patterns of PAs in Utah.

A cross sectional survey design was utilized. This study used a paper based survey tool mailed to 700 physician assistants practicing in the state of Utah. The survey was sent from October 2008 through January 2009. The outcome variables of interest were practice specialty (primary care versus specialty practice) and practice location (urban versus rural). The predictor or independent variables were age, gender, number of years in practice, location of upbringing, and professional school of graduation.

The survey was developed by a group of PA stakeholders based on the literature and relevant clinical and academic experiences. There was a response

rate of 67.7%. The Utah Division of Occupational and Professional Licensing (DOPL) provided the list of licensed PAs in the state, while population projections were used from the Utah Governor's Office of Planning and Budget (GOPB).

Physician assistants who reported being raised in rural communities were 2.29 times more likely to be practicing in rural communities (95% CI 0.89-5.85). Female PAs had lower odds of practicing in a rural area (OR: 0.26; 95%CI: 0.10-0.66). Age and years of practice was not significantly associated with predictors of rural practice in Utah. Female PAs had lower odds of practicing in primary care versus their male counterparts (OR: 0.56; 95% CI: 0.33-0.96). PAs had lower odds of practicing primary care if they reported a rural or suburban upbringing (OR: 0.49; 95%CI: 0.26-0.93 and OR: 0.33 95% CI: 0.16-0.66). Graduation from the Utah PA Program was more likely to result in primary care practice (OR: 2.16; 95% CI: 1.34-3.49).

Introduction

Approximately 80 % of the Utah population lives on the Wasatch Front, centering on Salt Lake City. Population growth along the Wasatch Front has made Utah one of the most urban states in the nation. [1] When the ratio of primary care physicians to population is assessed, Utah ranks last in the country. [2] There were 89.6 primary care physicians per 100,000 population in the US in 2008; Massachusetts ranked the highest with 129.4 primary care physicians and Utah with the lowest, 63.4. Nationally, primary care shortages are predicted as increasing numbers of physicians are selecting specialty practice. [3-7] One strategy to address primary care shortages has been to turn to physician assistants (PAs). PAs have

been shown to improve access to care for the underserved. [8] Increasing numbers of PAs are also entering specialty care although the flexibility and career mobility of PAs suggest they can also move out of specialties and into primary care. [9]

A Utah study in 2006 found there were 4,484 total physicians, which equated to 165 physicians per 100,000 population. In 2003, 29% of Utah physicians were in generalist fields. This study estimated Utah would need to recruit up to 270 physicians per year due to population growth, age demographics, loss of full-time equivalent (FTE), and retirement. Out of state trained physicians will be required because Utah's medical school will only meet 19%-22% of the projected annual demand for physicians. [10] Because the Governor's Office of Planning and Budget (GOPB) projects Utah's overall population to increase from 2.7 million to 3 million by 2012 and another million by 2020, more doctors may be needed. According to the U.S. Census Bureau, Utah was the second fastest growing state in the nation during 2009 with an annual growth rate of 2.1%. The number of Utahans over age 65 (as a percentage of the population) is expected to increase with estimates that the age 65 and older population will grow from 213,201 in 2000 to 319,564 in 2015 (a growth rate of 50%). [11]

The demographics of Utah are unique, ranking first in the country for population growth (due almost entirely to a high fertility rate). [12] More than 20% of the population are dependent children, stretching public services including public schools and health care. [13] Three factors--high fertility rate, growing elderly and increased utilization of health care services--are expected to increase the demand for primary care services.

Since the turn of the new century, workforce studies have focused on the increasing supply of PAs in the state. In Utah, the visibility of PAs has been increasing. From 2003 to 2008 the number of PAs has grown from 324 active PA licenses to 700 active PA licenses (116% growth).

To better understand the current distribution of PAs, along with the enablers and barriers to primary care and rural practice selection, we undertook a study on this labor force. Our research questions center on the following:

1. What is the distribution of PAs in the state of Utah?
2. What are the factors associated with primary care and rural practice selection?
3. Can PAs help address the increasing need for primary care providers in Utah by choosing primary care specialties?

Methods

A list of licensed PAs was obtained through the Utah Department of Commerce's Division of Professional Licensing (DOPL). In 2008, there were 700 licensed PAs in the state; a survey was sent to every PA. A total of three separate mailings were conducted over the period of October 2008 through January 2009. A total of 474 responses were received which equates to a 67.7% response rate. Of the 474 respondents, 432 PAs said they are actively practicing in Utah (90.7%). Survey responses were not weighted for nonrespondents for the purpose of the regression analysis. When checked for potential response biases based on year of licensure, age, gender and geography, a particularly low response rate was identified for Iron

County, a rural county located in southwest Utah. Targeted mailings to the PAs with addresses located in Iron County were conducted in an attempt to increase the response rate from that county.

Design of the Survey

A survey instrument was constructed based on two previous surveys (1998, and 2003) and a physician workforce survey (2006). A PA study committee included the University of Utah PA Program Director, the Executive Director of the Utah Academy of Physician Assistants, and three practicing PAs. Useful questions from previous surveys were incorporated.

Study Population

The study population was the universe of PAs licensed to practice in Utah in October 2008. PAs were categorized as primary care if their self-reported specialty was family practice, general internal medicine, pediatrics or obstetrics and gynecology. Rural or urban designation was based on county. Cache, Davis, Provo, Salt Lake, Weber, and Washington County were considered urban; 20 of the 26 counties were classified as rural. Utah has large counties and each contains some part that is rural or underserved. Additionally many health care providers live in urban zip codes and commute to rural ones, and vice versa. Utah has 5 urban communities, Salt Lake, Logan, Ogden, Provo and St. George and within these so-called urban communities, rural communities exist. The remaining counties all have populations less than 50, 000 in the county.

Study Variables and Statistical Analysis

Five variables related to demographic information were available within the survey. Multinomial logistic regression analysis was performed using SPSS 16.0 to assess the relationship of the predictive variable to the outcome of rural and/or primary care practice, using odds ratios with 95% confidence intervals (CIs).

Results

Responses were obtained from 432 of 700 physician assistants who are actively practicing in the state of Utah (Table 3.1). Thirty-six percent of Utah PAs are between the ages of 31 and 40 years, with males at 60.6% of the total respondents. Nearly half (47.4%) of the respondents have been in practice between 0 and 5 years. Location of upbringing was 17.2 % urban, 52.2% suburban, and 30.5% rural. Nearly half (47.6%) of the respondents graduated from the University of Utah Physician Assistant Program. Forty-five percent of physician assistants in Utah provide primary care and 85.3% practice in an urban location.

Except for Washington County, all of the counties with greater than 40% nonresponse rate were counties with fewer than 10 PAs in them. The only county with more than 5 PAs and greater than 50% nonresponse rate was Iron County. A targeted separate mailing was sent to Iron County PAs in order to attempt to increase response rates (Table 3.2). Response rate for males was higher than females, 71% and 63%, respectively. Increasing age and years of license resulted in slightly higher response rates (Table 3.3).

In logistic regression analysis, PAs age 31-40 had the highest odds of practicing in primary care (OR: 1.74; 95% CI: 0.85-3.57); however, it did not achieve statistical significance (Table 3.4). Female PAs had lower odds of practicing in primary care versus their male counterparts (OR: 0.56; 95% CI: 0.33-0.96). PAs had lower odds of practicing primary care if they reported a rural or suburban upbringing (OR 0.49; 95% CI: 0.26-0.93, and OR: 0.33 95% CI: 0.16-0.66). Graduation from the Utah PA Program was more likely to result in primary care practice (OR 2.16; 95% CI: 1.34-3.49). The only statistically significant predictors of primary care practice were being male (p=0.036), obtaining training in the state of Utah (p=0.002), and urban upbringing (p=0.008).

In logistic regression analysis, female PAs had lower odds of practicing in a rural area (OR: 0.26; 95% CI: 0.10-0.66, p=0.005) (Table 3.5). PAs who reported graduating from the Utah Physician Assistant Program had higher odds of practicing in a rural area (OR:1.33; 95% CI: 0.67-2.65, p=0.413), but this did not achieve statistical significance. PAs who practiced in a rural environment were more likely to report a rural upbringing (OR: 2.29; 95% CI: 0.89-5.85, p=.001). The only statistically significant factors were male gender (p=0.005), and rural upbringing (p=0.001). Age and years of practice was not significantly associated with predictors of rural practice in Utah. From 2003 to 2008, specialty practice choice of family medicine declined from 40% to 31.5% of the total Utah PA workforce (Table 3.6).

Discussion

PAs in Utah mirror the changing workforce demographics of the state: young, primarily urban and suburban-raised professionals. Under the current scenario, the potential use of PAs to blunt predicted rural and primary care shortages of Utah physicians may fall short. Within the last 10 years Utah has increasingly relied on PAs trained in other states because the state's PA program of 40 PAs graduates per year is insufficient. In fact the rural PA workforce is thinning; in 2008, a total of 88 PAs practiced in rural counties, consisting of 21.6% (19) female PAs and 78.4% (69) male PAs. In 2003, a total of 69 PAs practiced in rural counties, 33.8% (24) female and 66.2% (45) male.

Efforts are underway to bolster the nation's primary care workforce and the Patient Protection Affordable Care Act (PPACA) legislation of 2010 injects $250 million to improve primary care education for doctors, PAs and NPs. However, primary care may not be possible without incentives to practice in this specialty because salary was not independently predictive of either rural or specialty practice, nor were years of practice. [9] Influencing factors upon primary care and or rural practice include loan repayment and tax incentives --strategies that have been employed with success in other states.

Although many PAs have been shifting into specialty practice, primary care still remains a viable choice for many PAs entering the workforce. [14] PAs may be different from their physician counter parts when it comes to specialty choices. [15] Utah PAs were twice as likely to practice in a rural environment if they reported being raised in a rural community. Male gender has been significantly associated

with rural practice, and is reflected in this research. Although Utah has been traditionally male dominated PA profession, this is slowly changing. On average, the PA workforce in Utah graduated from a PA training program 15 years ago (median of 8 years). The mean number of years of experience for male PAs is much higher than for females PAs. There are 21.3% (79) of male PAs in the Utah workforce with over 20 years of experience, whereas only 6.1% (15) of female PAs have greater than 20 years of experience.

In this study rural location of upbringing was associated with statistically significant lower odds of practicing in primary care when compared to urban location of upbringing. One possible explanation is the overall increase in urban location of many primary care practice jobs. In general, the results of this study showed increased urbanization of the young profession.

Limitations of this study include the 67.7% response rate to the survey. This is higher than the American Academy of Physician Assistants (AAPA) survey 2009 response rate of 35%. The data were not weighted in the analysis. Low numbers of PAs practicing in some rural areas may limit the analysis. The distinction between rural and urban counties could have overlooked rural pockets within urban counties and the fact that may PAs live rural and commute to urban areas and vice versa could confound the results. Effort was made to locate the PA practice location, not the home address in the analysis, and zip codes were used to classify county of practice.

A second limitation of the study was the self-classification of rural, urban and suburban upbringing. Because of the changing nature of rurality in the state and the

age of the person answering the question, it was decided that self-classification was the method to employ. In this case, perception may be reality, and primarily for the sake of simplicity this method, which has been employed in other similar studies, was utilized. [16]

Conclusion

Factors such as rural, urban or suburban upbringing, gender, age, and years of practice are important as they relate to primary care and rural health care practice among PAs in Utah. A consistent and well-trained supply of PAs is critical to access to care for Utah citizens. Our findings suggest Utah will continue to experience shortages of primary care physicians that will be amplified in underserved and rural communities. Substantially increasing the number of PAs practicing in these areas may require a number of strategies that take into consideration demographic as well as personal factors. Rural versus urban practice choice among PAs in Utah could potentially be influenced by recruitment, training and retention efforts that facilitate workforce placement in critical areas. Key groups and leaders in primary care and rural health care could be canvassed as to how to implement effective strategies to influence PAs to enter primary care and or rural practice. For example county commissioners, small town majors, rural hospital administrators and local health department employees may have special interests and expertise in PA recruitment and mentoring. An absence of proactive strategies may be an opportunity missed as the path toward increasing specialization and urbanization has been well worn.

Table 3.1 2008 Utah PA Characteristics for the Study Population

PA Characteristics	N=432	Percent
Age		
21-30	55	12.7%
31-40	158	36.6%
41-50	100	23.1%
51-60	91	21.1%
61+	28	6.5%
Gender		
Female	170	39.4%
Male	262	60.6%
Years of Practice		
0-5	203	47.4%
6-10	89	20.8%
11-15	67	15.6%
16-20	34	7.9%
21+	35	8.3%
Practice Type		
Primary Care[1]	191	45.6%
Specialty Care	228	54.4%
Practice Location[2]		
Practice in Rural County	60	14.7%
Practice in Urban County	349	85.3%
Location of Upbringing[3]		
Urban	74	17.2%
Suburban	224	52.2%
Rural	131	30.5%
Physician Assistant School of Graduation		
Utah	203	47.6%
Other	223	52.3%

Table 3.1 continued

*474 surveys were returned, 432 (90.7%) reported they are clinically active in Utah

[1]Primary Care definition: Family Practice, General Internal Medicine, Pediatrics and Obstetrics and Gynecology.

[2]Five Utah Counties: Cache, Provo, Salt Lake, Weber and Washington county=urban; all others are considered rural. Location based on practice address zip code.

[3]Self-reported location of upbringing Rural/Suburban/Urban

Table 3.2 Response Characteristics by County

County	Response Rate
Beaver	50.0%
Box Elder	60.0%
Cache[1]	78.3%
Carbon	50.0%
Daggett	100.0%
Davis	63.1%
Duchesne	33.3%
Emery	100.0%
Garfield	0.0%
Grand	66.7%
Iron	44.4%
Juab	100.0%
Kane	100.0%
Millard	100.0%
Morgan	0.0%
Rich	100.0%
Salt Lake	70.6%
San Juan	100.0%
Sanpete	60.0%
Sevier	100.0%
Summit	66.7%
Tooele	62.5%
Uintah	100.0%
Utah	68.0%
Wasatch	50.0%
Washington	56.4%
Wayne	100.0%
Weber	66.0%
Out of State	58.9%
Total	66.7%

[1]Bold=U.S Census Bureau metropolitan area designation (urban county)

Table 3.3 Response Rate by Age, Gender and Years of License

Demographic Variable		Response rate
Gender		
	Male	71%
	Female	63%
Age		
	21-30	66.6%
	31-40	64.6%
	41-50	64.1%
	51-60	71.8%
	61+	71.4%
Years of Licensure		
	0 to 5	66.0%
	6 to 10	67.4%
	11 to 15	65.1%
	16 to 20	75.0%
	21+	77.7%

Table 3.4 Predictors of Primary Care[1]/Specialty Care Practice

Independent Variable	N=381*	OR (95% CI)	P value
Age[a]			
21-30	53	1.00	--
31-40	137	1.74 (0.85-3.57)	0.129
41-50	87	1.58 (0.67-3.74)	0.289
51-60	83	1.49 (0.55-4.02)	0.429
61+	21	0.52 (0.12-2.15)	0.367
Gender[b]			
Male	227	1.00	--
Female	154	0.56 (0.33-0.96)	0.035
Years of Practice[2,c]			
0-5	183	1.00	--
6-10	77	0.67 (0.35-1.28)	0.228
11-15	60	0.33 (0.14-0.76)	0.010
16-20	32	0.26 (0.09-0.76)	0.014
21+	29	0.49 (0.15-1.51)	0.214
Physician Assistant School of Graduation[d]			
Non-Utah PA school	198	1.00	--
Utah	183	2.16 (1.34-3.49)	0.002
Location of Upbringing[3,e]			
Urban	66	1.00	--
Suburban	198	0.49 (0.26-0.93)	0.029
Rural	117	0.33 (0.16-0.66)	0.002

*After deleting missing cases for all predictor variables listed above (for logistic regression), 381 of the 432 total records were left for analysis.

Table 3.4 continued

[1]Primary Care definition: Family Practice, General Internal Medicine, Pediatrics and Obstetrics and Gynecology.

[2] Years of Practice=Number of years since first license issue.

[3]Self-reported location of upbringing Rural/Suburban/Urban.

Baseline category for comparison is: [a]age <31yrs; [b]male; [c]0-5 yrs of practice; [d]non-Utah PA school graduate; [e]urban upbringing.

Table 3.5 Predictors of Rural/Urban[1] Practice

Independent Variable	N=381*	OR (95% CI)	P value
Age[a]			
21-30	51	1.00	--
31-40	136	0.98 (0.33-2.92)	1.012
41-50	86	1.18 (0.34-4.09)	0.848
51-60	76	1.48 (0.34-6.35)	0.674
61+	19	2.08 (0.31-14.0)	0.479
Gender[b]			
Male	218	1.00	--
Female	150	0.26 (0.10-0.66)	0.005
Years of Practice[2,c]			
0-5	179	1.00	--
6-10	76	0.34 (0.12-0.97)	0.045
11-15	57	0.75 (0.24-2.29)	0.617
16-20	28	0.42 (0.09-1.87)	0.255
21+	28	0.21 (0.03-1.26)	0.089
Physician Assistant School of Graduation[d]			
Non-Utah PA school	190	1.00	--
Utah	178	1.33 (0.67-2.65)	0.413
Location of Upbringing[3,e]			
Urban	62	1.00	--
Suburban	191	0.62 (0.23-1.67)	0.352
Rural	115	2.29 (0.89-5.85)	0.083

* After deleting missing cases for all predictor variables listed above (for logistic regression), 381 of the 432 total records were left for analysis.

Table 3.5 continued

[1]Five Utah Counties: Cache, Provo, Salt Lake, Weber and Washington county=urban; all others are considered rural. Location based on practice address zip code.

[2] Years of Practice=Number of years since first license issue

[3]Self-reported location of upbringing Rural/Suburban/Urban

Baseline category for comparison is: [a]age <31yrs; [b]male; [c]0-5 yrs of practice; [d]non-Utah PA school graduate; [e]urban upbringing.

Table 3.6 Comparison of Specialty for Practicing Physician Assistants in Utah, 2003 to 2008*

Specialty	2003	2008	Change
Family Medicine	40%	31.5%	-8.6%
Orthopedic Surgery	6.5%	10.6%	4.0%
Emergency Medicine	5.4%	6.0%	0.6%
Pediatrics-General	6.2%	5.8%	-0.4%
Internal Medicine/General	6.5%	4.4%	-2.2%
Dermatology	4.2%	4.2%	0.0%
Prev Med/Occ Med	3.8%	3.2%	-0.7%
Urology	1.9%	3.0%	1.1%
Cardiology	3.1%	2.8%	-0.3%
Hematology/Oncology	2.7%	2.8%	0.1%
OB/Gynecology	1.5%	2.5%	1.0%
Other Surgical Subspecialty	0.8%	2.5%	1.7%
Cardio-Thoracic Surgery	1.5%	1.9%	0.4%
Otolaryngology	0.4%	1.9%	1.5%
Neurology	1.2%	1.6%	0.4%

*Includes specialties with 10 or more PAs

References

1. Quality Growth Efficiency Tools (QGET) Databook. http://governor.utah.gov/dea/QGET/DataBook/4.htm Accessed Retrieved August 27, 2009.

2. American Academy of Family Physicians (AAFP) Family Physician Workforce Reform: Recommendations of the American Academy of Family Physicians. September 2009; http://www.aafp.org/online/en/home/policy/policies/w/workforce.html.

3. Kane GC, Grever MR, Kennedy JI, et al. The anticipated physician shortage: meeting the nation's need for physician services. *Am J Med.* Dec 2009;122(12):1156-1162.

4. Collwill JM, Cultice JM, Kruse RL. Will generalist physician supply meet demands of an increasing and aging population? *Health Affairs.* May-June 2008;27(3):W232-W241.

5. Busato A, Kunzi B. Primary care physician supply and other key determinants of health care utilisation: the case of Switzerland. *BMC Health Serv Res.* 2008.

6. Ogunyemi D, Edelstein R. Career intentions of US medical graduates and international medical graduates. *Journal of the National Medical Association.* OCT 2007;99(10):1132-1137.

7. Gorman D, Poole P, Scott J. On the maldistribution of the medical workforce. *Internal Medicine Journal.* OCT 2007;37(10):669-671.

8. Staton FS, Bhosle MJ, Camacho FT, Feldman SR, Balkrishnan R. How PAs improve access to care for the underserved. *JAAPA.* Jun 2007;20(6):32, 34, 36.

9. Morgan PA, Hooker RS. Choice of specialties among physician assistants in the United States. *Health Aff (Millwood).* May 2010;29(5):887-892.

10. Ha J, Utah Medical Education Council. *Utah's physician workforce : a study on the supply and distribution of physicians in Utah.* Salt Lake City, Utah: Utah Medical Education Council;2006.

11. Utah Department of Human Services. Utah Aging Initiative: Discovering and Identifying the Opportunities and Challenges of our Aging Population. In: Utah Department of Human Services, ed: Center for Public Policy and Administration-University of Utah; 2004-2005:56.

12. US Census Bureau. *State and County Quick Facts* 2009.

13. Utah Governor's Office of Planning and Budget (GOPB). *Population Estimates State of Utah and Counties 1940-2009.* : Utah Governor's Office of Planning and Budget, 18 Mar 2010.

14. Hooker RS, Cawley JF, Leinweber W. Career flexibility of physician assistants and the potential for more primary care. *Health Aff (Millwood).* May 2010;29(5):880-886.

15. Staiger DO, Auerbach DI, Buerhaus PI. Comparison of physician workforce estimates and supply projections. *JAMA.* Oct 21 2009;302(15):1674-1680.

16. Henry LR, Hooker RS, Yates KL. The role of physician assistants in rural health care: a systematic review of the literature. *The Journal of Rural Health.* 2 Sept 2010: 1-10.

CHAPTER 4

THE FUTURE OF PHYSICIAN ASSISTANTS IN UTAH: PROJECTIONS THROUGH 2025

Abstract

The objective of this paper is to study the future of physician assistants (PAs) in the state of Utah for the next 15 years. The nation is predicted to be experiencing a shortage of primary care physicians. PAs are licensed by the state to practice medicine with the supervision of a licensed physician. These analyses are intended to offer insight into the possible future of PA practice to fill these potential shortages. Modeling projections are based on methods of the Association of American Medical Colleges (AAMC) Center for Workforce Studies. Model 1 used data on the number of PAs currently in practice, the current utilization of PAs in primary and specialty care, and future population estimates by age. An alternative model, Model 2, is based on a model developed for the American Academy of Family Physicians (AAFP). Model 2 used data on the number presently in practice and the number that leave the profession through retirement, attrition, or death. Based on these two models, recent growth of the PA profession is expected to continue. The expected percent increase of PAs in primary care over the next 15 years is estimated

to be 32% in primary care and 42% in specialty care. The ratio of physician per PA is expected to decline from 11.7 in 2010 to 7.91 in 2025.

Introduction

The rapid growth of physician assistants (PAs) in the state of Utah has coincided with predicted shortages of primary care providers. Utah ranks 50th in the country for primary care physician to population ratios. [1] With major changes expected in the delivery of health care, estimation of PA workforce needs is perhaps more critical than ever before. Unique population factors in Utah, including large numbers of children and elderly, make primary care workforce planning critical in the era of increasing primary care physician shortages. In this study, the future numbers of physician assistants in Utah was projected. Model 1 used data on the number of PAs currently in practice, the current utilization of PAs in primary and specialty care, and future population estimates by age. Model 2 used data about the number presently in practice and the number who leave the profession through retirement, attrition, or death.

Modeling projections for Model 1 were based on the methods of the Association of American Medical Colleges (AAMC) Center for Workforce Studies. [2] This workforce analysis builds on previous studies by the Bureau of Health Professions in the Health Resources and Services Administration (HRSA) and a report from the Council On Graduate Medical Education (COGME). [3] Additionally, the methods in this paper used for Model 2 were built upon a model developed for the American Academy of Family Physicians (AAFP) by a team of consultants from

the University of Utah School of Medicine (UUSOM) and the Utah Medical Education Council (UMEC). [4, 5]

Several data sources were used to build the model. The number of PAs caring for patients in primary care and specialty care was collected by the UMEC in a survey of all 700 practicing PAs in the state of Utah in 2008. These data were a self-reported survey of physician assistants. The response rate was 67.7%. The data were weighted in the analysis. The Governors' Office of Budgetary Planning (GOPB) provided the population projections by age and gender up through 2025. [6]

The UMEC was founded in 1997 by the state legislature to address the health care shortage needs in Utah and has periodically published reports on physician assistants, physicians and nurse practitioners. Their mission is to promote healthcare workforce planning with a core interest in rural and primary care needs of the state. In 2006, UMEC reported a chronic maldistribution and shortage of primary care physicians in the state. [4] In subsequent analysis of PAs in the state, although no association per se can be made from the data, the conclusion was the shortage of physicians is fueling the recent surge of PAs in the state. [7]

The purpose of this study is to identify the future of PAs in Utah, and develop a model to project the future numbers of PAs who will be practicing in primary care in 10-15 years.

Methods

A serial cross-sectional study design was used to identify trends over a period of the next 15 years in this descriptive study. The survey was mailed to all

PAs with a license to practice in Utah in 2008. An advisory committee made up of PA stakeholders was formed to review the survey instrument and its purpose. The previous survey from 2003 was used as a guide, and an attempt was made to change as little as possible for the purposes of comparison. Unclear questions were reworded. Questions that seemed outdated or lacked purpose were eliminated. Three mailings were sent out over a period of 1 year. The advisory panel continued to meet throughout the entire process for oversight and input.

Model 1 is based on the methodology employed by the Association of American of Medical Colleges (AAMC) Center for Workforce Studies. [2] The following formula was adapted from the AAMC:

Future number of PAs=predicted population x age x current PA utilization in primary care and specialty care.

Factored into future population is age polarization of the state, which could be a proxy for increased need for health care due to a higher prevalence of diseases and conditions in the very old and young. Although health care reform is on the horizon, leaving the future uncertain, this model did not include a factor for increased utilization of PAs beyond the current baseline data.

Model 2 is based on the methods employed by the team of consultants from the University of Utah School of Medicine and the Utah Medical Education Council for the American Academy of Family Physicians. [5] The following broad formula was utilized:

Future number of PAs= current PAs + new PAs – exiting PAs due to retirement, death or attrition.

Assumptions in the model include a steady state productivity and efficiency of PAs in practice. The model assumes PAs can grow in numbers in response to an expected rise in demand and economic growth. [8]

PAs who were listed as actively licensed in the state of Utah were surveyed. To understand trends affecting PAs in Utah, the survey is conducted every 5 years by the UMEC. Responses to the survey were checked against Utah Division of Occupational and Professional Licensing (DOPL) information for potential response biases based on year of licensure, age, gender and geography.

Assumptions

In order to arrive at an estimate of the future of PAs several assumptions were made in the models. The assumptions are no change in the productivity of PAs, the number of patient visits per PA, change in demand for PA services utilization, or ability to increase the number of PAs available to practice clinically over the next 15 years. The projections also assume steady population growth in all age categories based on the GOPB population projections. The assumption is the state population will grow at the rates projected by the GOPB. These assumptions are justified because they are based on the best projections available by the Governors' Office given the inability to truly and accurately predict the future. No assumptions or adjustments were made about the impact of health care reform on demand for services.

Model 1

This model was used to project the number of PAs entering the Utah workforce through 2025 using the following formula: PCV_t=Primary Care Visits total determined by the calculation of a Primary Care mean (weekly outpatient) visits multiplied by the number of Primary Care PAs multiplied by 52 (weeks in a year) (PC_{mean}× PC_{PAs}) × 52 (Table 4.1).

Fifty-two weeks was used because these are the yearly PA clinical hours, in order to calculate total number of PAs projected, 52 was used rather than 50 or 48 depending on vacation or CME time offered per clinic. The variety of CME and vacation time varies from clinic to clinic. The use of 52 weeks better projects the number of actual PAs, with each clinic factoring in their benefit time away from clinic, or a scenario of 2 part time PAs or 4 part time PAs to fill out the year. SCV_t=Specialty Care Visits total determined by the calculation of a Specialty Care mean (weekly Inpatient) and a Specialty Care mean (weekly Outpatient) multiplied by the number of Specialty Care PAs (SCI_{mean}×SC_{PAs}+SCO_{mean}×SC_{PAs})× 52.

To account for Utah's unique age demographics and age polarization the number of estimated Primary Care Visits by Age Group were calculated. Estimated Primary Care Visits by Age Group Visits/Pop_{age}=Visits per Population by Age were calculated by PCV_t × % of PC visits/Population by age. Example: from the 0-19 age category, the population of Utah children as estimated by the census bureau was 893,132 for 2008, this age category accounted for 30% of all Primary Care visits from the survey, therefore .30 was multiplied by the

$PCV_t=(PCO_{mean}\times PC_{PAs})\times 52$ (1,528,193×. 30=458,458) divided by the population (893,132) to estimate Visits/Pop_{age} (0.51).

Model 2

A range of projections for the period of 2010-2025 was developed for numbers of PAs resulting in a low, middle and high projection model. Growth represents the number of new PAs projected to be added to the workforce. Replacement represents the number of new PAs needed to replace those who have left the workforce due to retirement or attrition. Licensure data for Utah PAs shows an estimated attrition rate of 1%. In each scenario, replacement due to retirement is based on the survey responses to the question regarding future retirement plans. Total annual number of PAs predicted each year is calculated as the sum of the growth and replacement projections. This projection assumes adequate physician workforce and no change in PA productivity or services.

Results

Model 1 projects the total number of PAs in primary care, specialty care and total PAs through the year 2025. The GOPB projections by age were used to calculate a total projected population from 2009 through 2025 multiplied by the Visits/Population determined by the Estimated Primary Care, Specialty Care Outpatient and Specialty Care Inpatient Visits by Age Group.

Table 4.2 shows the estimated primary care visits by age group using the formula $PCO_{mean}xPC_{PAs.}$ The estimated specialty care outpatient and in patient visits

by age group were calculated using a similar formula, $SCO_{mean}xSC_{PAs}$ and $SCI_{mean}xSC_{PAs,}$ in Tables 4.3 and 4.4.

Tables 4.5 and 4.6 calculated the population projected by age multiplied by visits per population using the following formula, PCV_t x % of PC visit/Population by age for primary care and SCV_t x % of SC visits/population by age for specialty inpatient and outpatient care.

The final result, Table 4.7, shows the number of PAs predicted in 5-year intervals given the projected population by age and current primary care and specialty care outpatient and inpatient productivity estimates. The model predicts the number of primary care and specialty care PAs separately using the same methods and population estimates.

Table 4.7 shows the total projected number of specialty PAs will increase at a slightly higher percentage than primary care PAs, although both are expected to increase by 2025. This may be due to the fact that the model takes into account an increasing aging population, with increased numbers of PAs in specialty care.

Figure 4. 1 shows the rise in primary care and specialty care over the next 15 years using this model. This model relies on PA-per-population ratios and takes into account health care services currently delivered by the total pool of practicing PAs. This assumes that future requirements will match the volume of services currently provided by PAs on a per PA basis. This approach is based on three assumptions: the current level, mix and distribution of providers in the population are adequate, the age of providers remain the constant in the future, the size and demographic

profile of the providers change over time in ways projected by currently observed trends.

One of the strengths of this model is that it takes into account primary care outpatient and specialty care inpatient and outpatient current productivity among PAs. This allows age projections and predictions about the utilization of PAs by age and by primary care or specialty care. Because Utah has unique age demographics (large numbers of children and elderly) this may be a particular strength to the model. The other strength of the model is it relies on current productivity in the clinic setting to predict, after factoring population growth of the state, the number of PAs in the state by 2025.

One of the limitations of the model is that it takes current productivity as the norm for the future. It does not take into account rural or urban demographics (there is a predicted aging of the rural population). This model assumes current PA utilization as baseline and no predicted increase in primary care or specialty care PA visits. This model does not take into account health care reform, or the need for increased PAs in primary care.

The model relies on population projections and current PA services. Therefore this model may predict low or bottom end growth if no other change in the health care system occurs. The model is not based on headcounts of providers, but has integrated parameters linked to professional productivity. This model has a disadvantage in that it does not factor in changes in the skill mix of the PA providers.

Model 2

Because of the limitations of the previous model, a second model was developed. This model is based on 2 factors: 1) growth and 2) replacement (which may be due to both retirement and attrition). Each scenario is based on a low, middle or high growth rate of new PAs, and then this growth rate is added to replacement for a total number of PAs projected into the future. A linear regression line is drawn into the future to achieve a number of PAs until 2025. This model predicts numbers of PAs by head count only (Figure 4.2).

Licensure data for Utah PAs show an estimated attrition rate of 1.0% per year. Tables 4.8, 4.9 and 4.10 show the projected workforce using the low, middle and high projection models. In each scenario, replacement due to retirement is based on the survey responses to the question regarding future retirement plans. The linear regression line based on a best-fit estimate set the growth projections of 3.1%, 4.6% and 5.1%.

The low-growth scenario averages a 3.1% rate of growth from 2010 to 2025 and assumes an average annual growth of approximately 26 new PAs, with an annual replacement of 25. The average total annual growth plus replacement in the low projection scenario assumes Utah will grow by approximately 51 PAs per year average to meet growth and replacement projections.

The middle growth scenario is an average of the low and high-growth projections. It projects an average growth rate of approximately 4.6% and assumes an average annual growth of 47 new PAs, with an average annual replacement of

approximately 27 PAs. The average total annual growth plus replacement under the middle growth scenario is approximately 73 PAs per year.

The high-growth projection is based on the presumption that the PA workforce will continue to expand at a rapid pace—at an average of 5.1%, starting with a high of 7.5%. In this scenario, Utah will add approximately 67 new PAs per year to account for new growth. Average replacement will be approximately 28 new PAs per year to account for retirement and attrition from the workforce. The average total growth and replacement in the high-growth scenario is approximately 92 PAs per year from 2010 to 2025.

The survey included a series of questions about years until planned retirement as well as planned reductions in the number of hours worked prior to retirement. Reflecting the young average age of the workforce, nearly 60% of the workforce did not plan on retiring until 16 years or more from now. Retirement does not appear to be a major factor in the future number of PAs (Table 4.11).

Attrition from moving to other states also does not appear to be a major problem in the future of PAs. Speculation in this regard also comes from a question asked on the survey: when asked about factors influencing their decision to practice in Utah, PAs indicated that “Family in Utah”, “Lifestyle”, “Recreational Opportunities” and “Raised in Utah” were the most influential factors affecting the decision to practice in Utah.

The strength of the model is its simplicity. The future projections are based solely on current PAs in practice multiplied by a growth factor minus exiting PAs. New PAs were not projected by using training slots available in the state because

most PAs are trained in other states and move back to Utah. The limitation of the model is that the growth is projected nearly completely at where the regression line is set, 3.1%, 4.6% and 5.1%. The low and high were set after factoring in retirement and attrition to account for past trends in growth over the last 5 years. The middle projection was just an average of the high and the low. The limitation of this method is the fact that efficiency and any change in work structure or technological advancements were not factored into the model. No attempt was made to account for different growth patterns in specialty versus primary care.

PA Growth Rate Versus Physician Growth Rate: Projected

Using the middle growth rate model projection and predictions from 2006 about the number of licensed physicians, a ratio of physicians per PAs was calculated. [4] The number of physicians per PA is projected to decline from 11 physicians per 1 PA, to 8 physicians to 1 PA. Physician growth is predicted to be 2% and the number of physicians added to the workforce modest at approximately 200 per year (Table 4.12).

Table 4.13 shows the predicted PA to population ratio projections using the middle growth model. The GOPB predicts the number of Utahans is expected to increase by approximately 1 million in the next 15 years. The percentage of urban to rural population is predicted to rise.

Discussion

Based on these two models, recent growth of the PA profession is expected to continue into the near future. Specialty care PAs should experience continued growth, but primary care PAs will also increase in numbers. The expected percent increase of PAs in primary care over the next 15 years is estimated to be 32%. In specialty care the percent increase in PAs should be 42%. Using the middle projection model in Model 2, expected percent increase of the PA profession should be 113%. The ratio of physicians per PA is also expected to decline from 11.7 in 2010 to 7.91 in 2025. The ratio of PAs to 100,000 population is expected to increase from 27 to 37. Population growth in urban areas should continue with PA growth in urban areas to continue as well.

Workforce projects at the state level such as this are limited by the assumptions in the models. Model 1 included assumptions about the number of patients each PA was currently caring for (self-reported). No change in the future productivity of the PAs was factored into the models. Increased numbers of patients due to an influx of insured patients from health care reform was not factored into the model. Finally, patient acuity or the complexity of each PA's patient panel was not included.

In Model 2, attrition and retirement were not major factors in the model. Questions were included on the survey asking the PA providers their retirement or decrease in work hours plans for their future. Retirement plans could be altered given the economy, as has been seen recently. These are personal decisions, asking the PA to predict their own retirement 15 years in the future, and are subject to

change. A limitation is the overall regression line and predicting future growth. Several other models, including a polynomial regression (a more curved line) could reflect the future trend in the number of PAs better than the linear regression.

Ninety percent of all PAs licensed in the state of Utah are clinically active. The majority of the workforce does not plan on retiring for 16 or more years. The short training time for PAs (approximately 2.4 years) will result in increasing numbers over a relatively short time period. The relative youthfulness of the profession also mitigates the risk of attrition through death as well as retirement. Finally, PAs can and do move between specialty practice and primary care practice, and within specialty care practice, perhaps mitigating the choice between the two roles. [9] Numbers of primary care PAs are expected to increase, although specialty care numbers will increase more, thus making the overall percentage of PAs in specialty care appear greater.

Estimating the future number of PAs is important for several reasons. Such efforts may help supply high quality PAs by helping in planning high quality education by training the appropriate number of PAs. Finally, the information will be useful for professional organizations on a local and national level in assessing opportunities available for the PA profession.

The importance of evaluating the number of PAs needed for the future has not gone unrecognized. Recently, a research summit was held by the PA profession, the American Academy of PAs (AAPA), the Accreditation and Review Committee (ARC-PAs), and the National Commission on Certification of Physician Assistants (NCCPA) organizations brought to light the importance of PA workforce research on

a national and local level. This group concluded that PAs should be included in national databases to ensure adequate assessments of the overall health care workforce team. Integration into physician workforce modeling will also be important, especially with the potential implications from the health care reform on the horizon. [10]

During the next 15 years physician workforce needs in various specialties will be undertaken by their respective professional organizations. These projections for strong growth of the PA profession will need to be considered in the light of increasing specialization of the physician workforce.

Conclusion

Two different models showed potential continued strong growth in the future numbers of PAs, growth in both primary care and specialty care, with increasing growth in specialty care as a greater percentage of the PA workforce. Although attrition and retirement were included in Model 2, these are not expected to be major issues facing the profession in the next 15 years. Growth from young new graduates will be the major part of the projection models that will fuel the profession in the near future.

Whether the predicted shortages of physicians in Utah and the already low ratio of primary care physicians to population will also result in increases in the number of practicing PAs in the state still remains a question.

The models do not include any predicted changes in health care utilization. With health care reform, a decline in the number of uninsured may be possible. In

this scenario, health care workforce modeling may under-predict the number of health care providers who will be needed to serve the newly insured. Certainly demand for primary care services for the under and uninsured will be greatly increased. The number of primary care physicians needed may also be under estimated, as physicians are also entering specialty care. Since the physician population is aging, retirement and attrition is likely in the near future.

PAs provide a substantial service to over one million patient care visits in 2008 in Utah. PAs roles may be expanding into specialty care more in future years, with increasing urbanization of both the population and the PA workforce. Based on two different models, the PA profession in Utah should experience robust growth over the next 15 years.

There is no accepted approach to forecasting the future PA future workforce. Both models approach the problem with a number of assumptions and limitations that should be acknowledged. However, the value of projections is for policy-makers to respond to emerging trends. The PA profession has been more closely examined as the answer to predicted physician shortages, especially in primary care. Some concern has been voiced that PAs are going into specialty care exclusively. These predictions show the numbers of PAs are predicted to grow profoundly in both primary care and specialty care.

With predicted physician shortages in Utah, already ranked last in the country in primary care physician to population ratios, how can PAs be utilized to help with these workforce needs? Will the future number of PAs, if the models are close to future trends, help to mitigate these shortages? Although our research

shows the population to physician ratio to be declining, and the population to PA ratio to be increasing, there may not be enough PAs to fill the predicted shortages of primary care physicians.

Future studies will need to focus on the health care teams-to understand more directly how PAs may help physicians in the light of increasing demand for primary care and specialty care services in the state of Utah.

Table 4.1 Type of Visit and Formula

Type of Visit	Base Year 2008	Formula
Primary Care Mean (Outpatient visits per week) [1]	92.3	PCO_{mean}
Primary Care PAs	318.4	PC_{PAs}
Primary Care Visits (yearly)	1,528,193	$(PCO_{mean} \times PC_{PAs}) \times 52$
Specialty Care Mean (Outpatients)	61.0	SCO_{mean}
Specialty Care Mean (Inpatient)	13.6	SCI_{mean}
Specialty Care PAs	381.6	SC_{PAs}
Specialty Care Outpatient Visits	1,209,641.5	$(SCO_{mean} \text{x } SC_{PAs}) \times 52$
Specialty Care Inpatient Visits	269,867.5	$(SCI_{mean} \times SC_{PAs}) \times 52$
Total Visits	3,007,702	$PCV_t + SCV_t$
Total Visits/PA[2]	4,297	$PCV_t + SCV_t$ /PA

[1] Primary care mean number of outpatient visits per week were calculated from the actual survey answers of all 434 PAs
[2] Total PAs used in this calculation were the total number of licenses PAs 700.

Table 4.2 Estimated Primary Care Visits by Age Group

Primary Care Visits by Age Group*	Visits	Population	$Visits/Pop_{age}$
0-19 (30% of PC visits)	458,458	893,132	0.51
20-64 (44% of PC visits)	672,405	1,407,699	0.48
65-84 (18% of PC visits)	275,075	191,997	1.43
85+ (8% of PC visits)	122,255	30,566	4.00

*$PCO_{mean} \text{x} PC_{PAs}$

Table 4.3 Estimated Specialty Care Outpatient Visits by Age Group per Year

Specialty Care Outpatient Visits by Age Group*	Visits	Population	Visits/Pop
0-19 (14% of SC visits)	169,350	893,132	0.19
20-64 (45% of SC visits)	544,339	1,407,699	0.39
65-84 (32% of SC visits)	387,085	191,997	2.02
85+ (9% of SC visits)	108,868	30,566	3.56

* $SCO_{mean}xSC_{PAs}$

Table 4.4 Estimated Specialty Care Inpatient Visits by Age Group per Year

Specialty Care Inpatient Visits by Age Group*	Visits	Population	Visits/Pop
0-19 (7% of SC visits)	18,891	893,132	0.02
20-64 (32% of SC visits)	86,358	1,407,699	0.06
65-84 (47% of SC visits)	126,838	191,997	0.66
85+ (14% of SC visits)	37,781	30,566	1.24

* $SCI_{mean}xSC_{PAs}$

Table 4.5 Population Projected by Age Multiplied by Visits/Population*

Age Group	2010	2015	2020	2025
0-19	469,021	498,727	530,088	564,233
20-64	690,939	731,056	772,056	822,028
65-84	289,361	348,916	428,959	512,393
85+	131,306	149,717	166,744	191,594
Total	1,580,630	1,728,417	1,897,848	2,090,250

*PCV_t x % of PC visit/Population by age

Table 4.6 Total Specialty Care Inpatient and Outpatient Visits Projected*

Age Group	2010	2015	2020	2025
0-19	192,578	204,775	217,651	231,671
20-64	648,081	685,709	724,166	771,039
65-84	540,615	651,881	801,427	957,306
85+	157,506	179,590	200,014	229,823
Total	1,538,781	1,721,957	1,943,260	2,189,840

*SCV_t x % of SC visits/population by age

Table 4.7 Total Projected Number of PAs

Practice Type	2010	2015	2020	2025
Primary Care PAs	329	360	395	436
Specialty Care PAs	396	433	500	564
Total	726	804	869	1000

Table 4.8 Low Growth Projection-2010-2025, Average Growth Rate 3.1%

Year	Growth Rate	Low Growth Number of PAs (Growth)	Retirement & Attrition (Replacement)	Total Annual Need (Growth + Replacement)	Low Growth Projected Total Workforce
2010	2.9%	19	16	35	691
2011	2.9%	20	16	36	711
2012	3.1%	22	16	39	733
2013	3.1%	23	17	39	756
2014	4.4%	33	27	60	789
2015	3.0%	24	27	51	813
2016	3.0%	24	27	52	838
2017	3.0%	25	28	52	862
2018	3.0%	26	28	53	888
2019	2.6%	23	25	49	912
2020	3.0%	28	25	53	939
2021	2.9%	28	26	53	967
2022	2.9%	28	26	54	995
2023	2.9%	29	26	55	1024
2024	3.4%	35	33	68	1059
2025	2.8%	30	33	63	1089
Average	3.1%	26	25	51	NA

Table 4.9 Middle Growth Projection-2010-2025, Average Growth Rate 4.6%

Year	Growth Rate	Middle Growth Need (Growth)	Retirement & Attrition (Replacement)	Total Annual Need (Growth + Replacement)	Middle Projected Workforce
2010	6.0%	42	16	58	793
2011	5.7%	44	17	60	836
2012	5.6%	45	17	62	881
2013	5.3%	45	18	63	926
2014	5.6%	50	28	78	976
2015	4.8%	46	29	74	1022
2016	4.6%	46	29	75	1068
2017	4.5%	46	29	76	1114
2018	4.3%	46	30	76	1160
2019	4.0%	45	27	73	1206
2020	4.1%	48	28	75	1253
2021	3.9%	47	28	76	1301
2022	3.8%	48	29	76	1349
2023	3.7%	48	29	77	1397
2024	3.8%	51	36	87	1448
2025	3.4%	49	36	85	1497
Average	4.6%	47	27	73	NA

Table 4.10 High Growth Projection-2010-2025, Average Growth Rate 5.1%

Year	Growth Rate	High Growth (Growth)	Retirement & Attrition (Replacement)	Total Annual (Growth + Replacement)	High Growth Projected Workforce
2010	7.5%	67	17	84	894
2011	7.0%	67	17	85	961
2012	6.5%	67	18	85	1029
2013	6.1%	67	19	86	1096
2014	5.8%	67	29	97	1163
2015	5.5%	67	30	97	1231
2016	5.2%	67	31	98	1298
2017	4.9%	67	31	99	1365
2018	4.7%	67	32	99	1433
2019	4.5%	67	29	97	1500
2020	4.3%	67	30	97	1568
2021	4.1%	67	31	98	1635
2022	4.0%	67	31	99	1702
2023	3.8%	67	32	99	1770
2024	3.7%	67	39	106	1837
2025	3.5%	67	39	107	1904
Average	5.1%	67	28	96	

Table 4.11 Projected Retirement 2010-2025, Based on UMEC Survey Results

Year	Number of PAs expected to retire
2010	9
2011	9
2012	9
2013	9
2014	19
2015	19
2016	19
2017	19
2018	19
2019	16
2020	16
2021	16
2022	16
2023	16
2024	22
2025	22

Table 4.12 Utah Licensed PA Count to Physician Projected Ratios, 2010-2025, Using the Middle Growth Rate Model

Year	Licensed PA Count (Projected)	Licensed Physician Count (Projected)	Ratio (Physicians per PA)	PA Growth Rate	PA Growth	Physician Growth Rate	Physician Growth
2010	793	8,792	11.09	6.0%	73	2%	203
2011	836	8,995	10.76	5.7%	44	2%	203
2012	881	9,199	10.44	5.6%	45	2%	203
2013	926	9,402	10.15	5.3%	45	2%	203
2014	976	9,605	9.84	5.6%	50	2%	203
2015	1,022	9,809	9.60	4.8%	46	2%	203
2016	1,068	10,012	9.38	4.6%	46	2%	203
2017	1,114	10,216	9.17	4.5%	46	2%	203
2018	1,160	10,419	8.98	4.3%	46	2%	203
2019	1,206	10,622	8.81	4.0%	45	2%	203
2020	1,253	10,826	8.64	4.1%	48	2%	203
2021	1,301	11,029	8.48	3.9%	47	2%	203
2022	1,349	11,233	8.33	3.8%	48	2%	203
2023	1,397	11,436	8.19	3.7%	48	2%	203
2024	1,448	11,639	8.04	3.8%	51	2%	203
2025	1,497	11,843	7.91	3.4%	49	2%	203

Table 4.13 Utah Licensed PA to Population Ratio Projections, 2010-2025, Using Middle Growth Model

Year	PA Count (Projected)	Utah Population	Ratio (PAs per 100K Pop)
2010	793	2,927,643	27.07
2011	836	2,999,816	27.88
2012	881	3,071,748	28.68
2013	926	3,144,044	29.45
2014	976	3,216,563	30.35
2015	1022	3,289,506	31.07
2016	1068	3,362,344	31.76
2017	1114	3,434,916	32.43
2018	1160	3,507,503	33.08
2019	1206	3,580,081	33.68
2020	1253	3,652,547	34.32
2021	1301	3,725,094	34.92
2022	1349	3,797,736	35.51
2023	1397	3,870,473	36.09
2024	1448	3,943,426	36.72
2025	1497	4,016,770	37.26

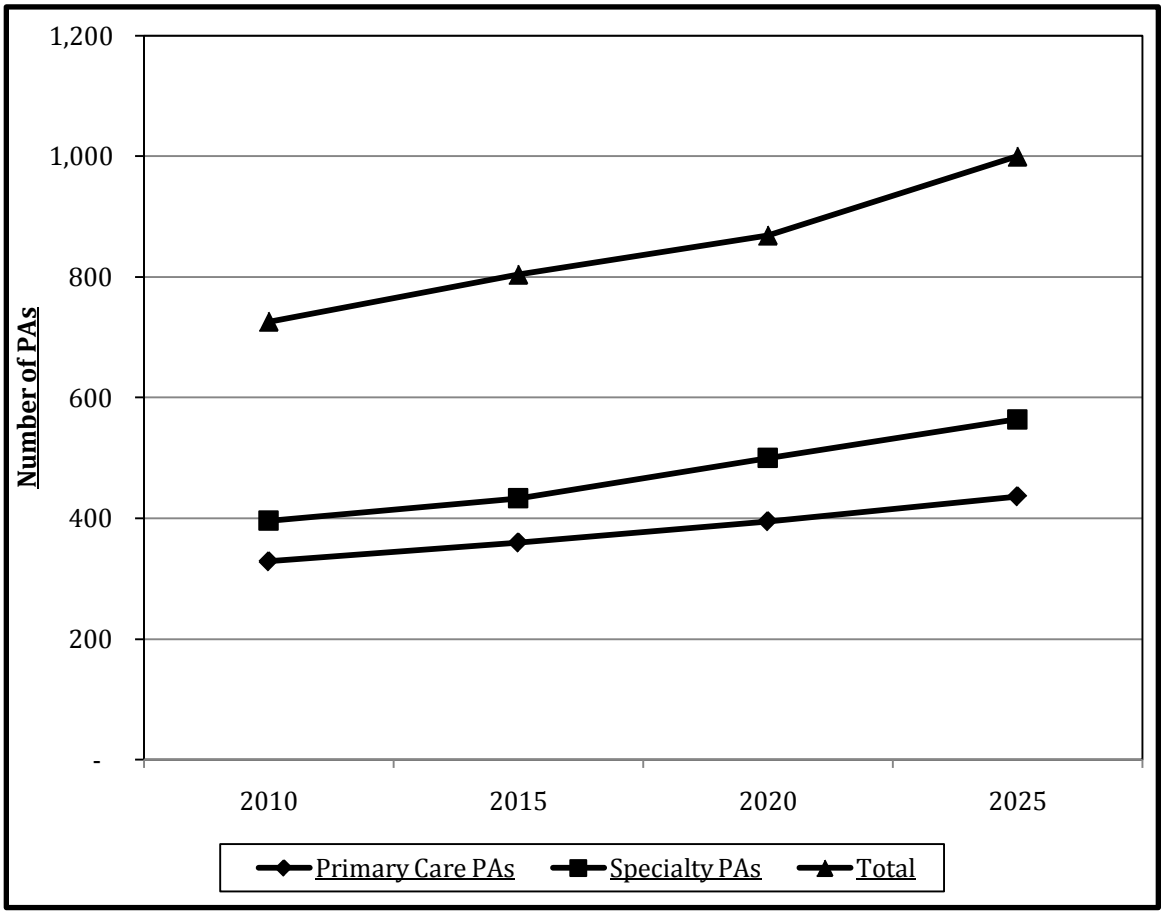

Figure 4.1 Total Projected PAs by Primary Care and Specialty Care

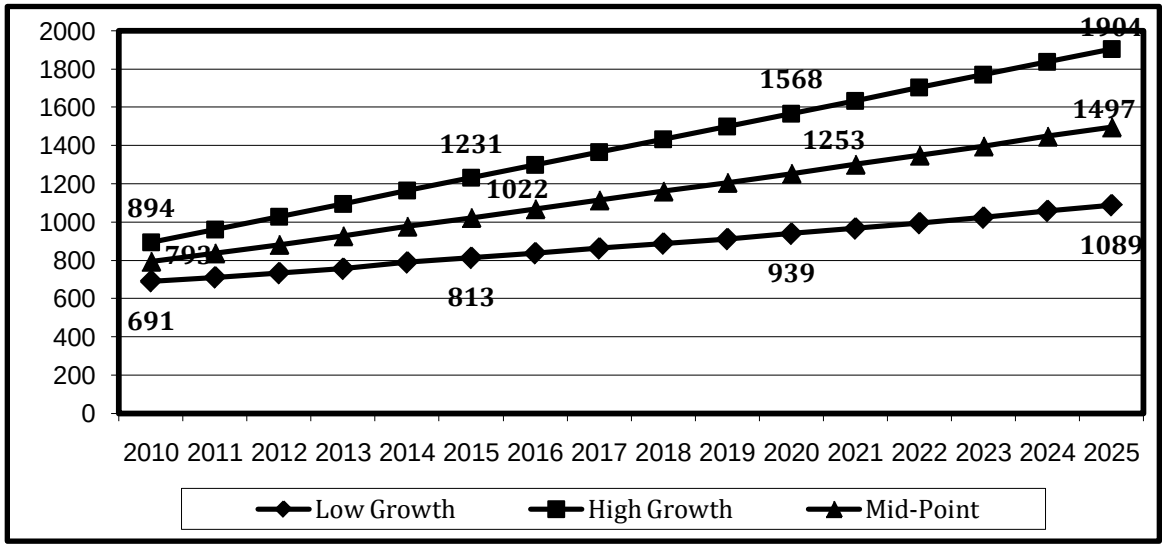

Figure 4.2 PA Workforce Projections 2010-2025

References

1. Association of American Medical Colleges (AAMC). 2009 State Physician Workforce Data Book. Available at: https://www.aamc.org/data/ 2009.

2. Association of American Medical Colleges (AAMC). The Complexities of Physician Supply and Demand: Projections Through 2025. October 2008; 94.

3. Council on Graduate Medical Education (COGME). Physician Workforce Policy Guidelines for the United States, 2000-2020. 2005.

4. Ha J, Utah Medical Education Council. *Utah's physician workforce : a study on the supply and distribution of physicians in Utah.* Salt Lake City, Utah: Utah Medical Education Council;2006.

5. American Academy of Family Physicians (AAFP). Family Physician Workforce Reform: Recommendations of the American Academy of Family Physicians. October 2008; http://www.aafp.org/online/en/home/policy/policies/w/workforce.html.

6. Utah Governor's Office of Planning and Budget (GOPB). *Population Estimates State of Utah and Counties 1940-2009.* : Utah Governor's Office of Planning and Budget, 18 Mar 2010.

7. Utah Medical Education Council (UMEC). *Utah's Physician Assistant Workforce, 2010*.

8. Dodoo MS, Green LA, Phillips RL, Fryer GE, McCann JL, Klein LS. Excess, shortage, or sufficient physician workforce: how could we know? *Am Fam Physician.* Nov 1 2005;72(9):1670.

9. Hooker RS, Cawley JF, Leinweber W. Career flexibility of physician assistants and the potential for more primary care. *Health Aff (Millwood).* May 2010;29(5):880-886.

10. Hooker RS. Physician assistants, economics, and workforce modeling. *JAAPA.* Jul 2010;23(7):10.

CHAPTER 5

CONCLUSION

Primary care has been shown to have a positive impact on the health of the U.S. population. [1] The Patient Protection and Affordable Care Act of 2010 is expected to result in a larger portion of the population seeking health care. [2] Utah has unique demographic and geographic distributions that will present additional challenges. In rural and frontier areas, many residents are forced to have to travel long distances for their health care. The rest of the population, nearly 80% of the total population of the state, lives along the Wasatch Front. Primary care shortages may exist in all areas of the state, and a variety of health care providers in addition to physicians, may be needed in the future. Utah has large numbers of children and elderly, who may utilize health care more frequently and at a higher cost. Significant challenges exist to meet the health care needs of the state. [3]

The 10 Essential Services of Public Health published on the Center for Disease Control (CDC) website lists essential services such as "link people to needed personal health services and assure the provision of health care when otherwise unavailable" and "assure competent public and personal health care workforce." PAs in the state of Utah provide essential services and access for rural and primary care patients. Additionally, the 10 Essential Services discusses the evaluation of

accessibility and quality of personal and population-based health care services. Research is also essential for innovative solutions to health care problems. This research sought to answer questions about the role of physician assistants and their potential to provide essential services in primary care and rural areas.

Key Findings

The number of PAs is growing more rapidly in surgical and specialty care than in primary care. [4] Health care researchers do not agree on the best methods to analyze trends in the supply of physicians or PAs. [5] Because of the recent and rapid rise of PAs in the U.S. health care workforce, health care researchers are just beginning to utilize national databases to quantify the growth and contribution of PAs to the workforce in the U.S. [6]

State specific research can be one of the most accurate sources of data because it often comes from licensure files and can be very complete. Additional questions about productivity, PA-physician interaction and supervision can be tailored to explore deeper research questions. Several states and regional health workforce centers exist and collect data about the trends and supply of PAs. [7] Utah has been collecting data on PAs and physicians in tandem surveys for over 10 years.[8]

Female PAs had lower odds of practicing in primary care versus their male counterparts. PAs had lower odds of practicing in primary care if they reported a rural or suburban upbringing. Graduation from the Utah PA Program was more likely to result in primary care practice.

Female PAs had lower odds of practicing in a rural area. PAs who reported graduating from the Utah PA program had higher odds of practicing in a rural area. PAs who practiced in a rural environment were more likely to report a rural upbringing.

There should be a rise in the number of specialty trained PAs in the state, but primary care PAs will also increase in overall numbers. Retirement and attrition should not be major issues facing the profession in the next 15 years. Growth from young new graduates will be the major part of the projection models that will fuel the growth of the profession in the near future. However, the physician population is aging and retirement and attrition are likely in the near future.

PAs provide a substantial service to over one million patient care visits in Utah in 2008. PA roles may be expanding into specialty care more in the future, with increasing urbanization of both the population and the PA workforce. Based on two different models, the PA profession in Utah should experience robust growth over the next 15 years.

Potential Applications of the Results

Physician assistants deliver health care in a variety of health care settings including primary care. Approximately 35% of all PAs practice in primary care. Although health care in the U.S. is undergoing significant changes, the primary care needs of the country are expected to increase and predicted primary care shortages appear imminent. Physician assistants have been a critical part of the contribution of primary care services since the profession's inception in the late 1960s and early

1970s. During the past 40 years of this relatively new profession, the role of the PA has evolved to include a great deal of health care responsibility and filling the gaps in shortages of physicians in both specialty and primary care.

At the state and local level, workforce studies will be increasingly important to predict future health care trends. State specific data will need to be combined with national data on PAs for a full picture of the supply and demand of primary care providers. Comparisons between providers for a rich picture of the overall workforce needs of the country will be important. The difficulty in predicting workforce shortages is compounded by the lack of inclusion of all providers in national and local data collection. Additionally the lack of uniformity of methods and collection analysis compounds the problem. With increasingly scarce federal and state workforce research resources, the efficient collection of data will reach a critical need.

Physician assistants, with their relatively short training period and flexibility in the workplace, are uniquely suited to filling gaps in health care utilization. [9]

Summary

The U.S. health care primary care system will be challenged in the future to provide health care in an increasingly changing health care environment. Primary care will experience pressures to fill the need when health care reform is fully realized by the public. The growth of the elderly underserved and underinsured populations and increases in health care spending and cutbacks will cause primary care to be of increasing importance. At the same time primary care physician supply

is shrinking. The PA workforce is a potential solution to this health care crisis. But without incentives to practice in underserved and/or primary care shortage areas PAs may not fully realize their potential to fill these gaps. Policy makers will need more data to assess the contribution of PAs to the overall health care system.

References

1. Phillips RL, Jr., Bazemore AW. Primary care and why it matters for U.S. health system reform. *Health Aff (Millwood).* May 2010;29(5):806-810.

2. Goodson JD. Patient Protection and Affordable Care Act: promise and peril for primary care. *Ann Intern Med.* Jun 1 2010;152(11):742-744.

3. Staton FS, Bhosle MJ, Camacho FT, Feldman SR, Balkrishnan R. How PAs improve access to care for the underserved. *JAAPA.* Jun 2007;20(6):32, 34, 36.

4. Morgan PA, Hooker RS. Choice of specialties among physician assistants in the United States. *Health Aff (Millwood).* May 2010;29(5):887-892.

5. AAMC. The Complexities of Physician Asupply and Demand: Projections Through 2025. October 2008; 94. Available at: https://services.aamc.org/publications/index.cfm?fuseaction=Product.displayForm&prd_id=244.

6. Morgan PA, Strand J, Ostbye T, Albanese MA. Missing in action: care by physician assistants and nurse practitioners in national health surveys. *Health Serv Res.* Oct 2007;42(5):2022-2037.

7. Morgan P, Strand De Oliveira J, Short N. Physician assistants and nurse practitioners: a mission component in state workforce assessments. *J Interprof Care.* Sep 2010(Early Online, 1-6):1-6.

8. Pedersen DM, Chappell B, Elison G, Bunnell R. The productivity of PAs, APRNs, and physicians in Utah. *JAAPA.* Jan 2008;21(1):42-44, 47.

9. Cawley JF. Physician assistant supply and demand. *JAAPA.* Aug 2005;18(8):11-12.